PowerWAVE 1000

1 kVA to 3 kVA Single Phase UPS

User Manual

Uninterruptible Power Supplies Ltd

A KOHLER COMPANY

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1 Safety

1.1 Description of symbols used in this manual

WARNING: The warning symbol is used where there is danger of an electrical shock, equipment damage or personal-injury.

CAUTION: *The caution symbol is used to highlight important information to avoid possible equipment malfunction or damage.*

1.2 User precautions

WARNING: Do not attempt to install this UPS system until you are satisfied that ALL the safety instructions and hazard warnings contained in this manual are read and fully understood.

WARNING: Keep this manual with the UPS for future reference.

WARNING: The UPS and peripheral equipment must be installed by a suitably qualified person who is aware of the potential shock hazards.

WARNING: Before it is put into service, this UPS must be set-up and commissioned by a suitably qualified person in accordance with the procedures contained in Chapter 3.

WARNING: This equipment is earthed via its input supply power cord. Do not disconnect the UPS input power cord from the utility supply socket while the UPS is operating.

WARNING: This UPS does not contain any user-serviceable parts. If the UPS develops a fault it must be repaired by a trained engineer.
You run risk of exposure to dangerous voltages if you open UPS-covers!
Uninterruptible Power Supplies Ltd will assume no responsibility or liability for accidents or injuries due to incorrect operation or manipulation of the UPS or peripheral equipment.

CAUTION: *The PowerWave 1000 is a Class A UPS product (according to EN 62040-3).*
In a domestic environment the UPS may cause radio interference and the user may be required to undertake additional measures.

1.3 Important safety notes

CAUTION: *Please read the following notes carefully prior to installation.*

Although the PowerWave 1000 UPS was designed for simple plug-and-play installation, we recommended that it is installed by a suitably qualified service specialist. The UPS does not contain any user-serviceable parts, so if it malfunctions it must be serviced or repaired by a trained engineer.

The UPS is equipped with an electromagnetic interference filter (EMI). Do not disconnect the UPS input power cable from the utility mains supply outlet at any time while the UPS is operating, even if the utility supply has failed.

To prevent the UPS from overheating, the ventilation grills on the UPS front panel must be kept free of obstructions at all times. For the Tower UPS model a minimum clearance of 300 mm (12 in) must be provided at the front, rear and sides of the UPS to allow adequate cooling airflow – with 500 mm (20 in) rear access required for cabling and maintenance (this may be achieved by using cables of a sufficient length to allow the UPS to be pulled forward for rear access). In the case of the rack-mounted UPS model, a minimum clearance of 300 mm (12 in) is required to allow adequate cooling but the minimum front and rear access required for installation and cabling increases to 800 mm (31 in).

In all cases the UPS equipment must be installed such as to allow safe pedestrian passage.

The UPS is must be installed in a sheltered and controlled environment away from direct sunlight. The operating temperature should be between 0-40°C with relative humidity of 30-90%, non-condensing. Further details concerning the installation environment are provided in the installation chapter of this manual.

Before installing the equipment you must check to ensure that the UPS input voltage stated on the UPS data-plate on the back of the unit matches your local utility supply voltage.

The UPS warranty will be rendered void, and the manufacturer reserves the right to refuse replacement or compensation in the following events:

- Accidental damage to the UPS.
- Damage or malfunction due to installing the UPS in an environment that does not meet the conditions specified in this manual.
- Damage or malfunction due to improper installation, configuration or maintenance carried out by an unauthorised person.

1.4 Storage instructions

If you intend to store the UPS for an extended period, in a moderate climate, the batteries should be charged for 12 hours every 3 months by connecting the UPS to the utility supply. If the ambient temperature at the storage location is above 30°C, this should be carried out every 2 months.

CAUTION: *Always switch off the UPS when moving the UPS.*

2 Description

2.1 Introduction

Congratulations on your purchase of the PowerWave 1000 UPS.

High reliability, low operating cost and excellent electrical performance are just some of the highlights of this innovative UPS solution.

By using the latest technological developments in power engineering, the PowerWave 1000 represents a new generation of transformerless UPS-System. Its advanced double conversion Voltage and Frequency Independent (VFI) topology responds fully to both the highest availability, and environmentally friendly requirements, compliant with IEC 62040-3 (VFI-SS-111) standards. A full UPS specification is shown in chapter 8 of this manual.

Uninterruptible Power Supplies Ltd specialises in the installation and maintenance of Uninterruptible Power Systems; and this powerful UPS is just one example of our wide range of state-of-the-art power protection devices that will provide your critical equipment with a steady and reliable power supply for many years.

2.1.1 Key features

The highlights of this innovative UPS solution include its high reliability, low operating costs and excellent electrical performance. Its key features include:

- High-frequency transformerless technology with a rack/tower-compatible enclosure which permits the integration of the UPS even under the most challenging space constraints.
- User friendly design that permits simple and trouble-free installation. All units up to 3 kVA are supplied with input and output power cables as standard.
- Internal, maintenance-free battery reduces the need for after-sales service.
- True online technology continuously supplies your critical applications with stable, regulated, transient-free pure sine-wave AC power.
- Highly efficient PWM sine-wave technology yields excellent UPS efficiency. The high crest factor of the inverter handles peak inrush current loads and so avoids a need to upgrade to a UPS with a higher power rating.
- Designed to comply with various stringent international standards for electromagnetic interference & protection (EMC).
- Inbuilt frequency changer capabilities that can be selected for 50/60 Hz or 60/50 Hz input/output frequency operation.
- This UPS is equipped with fully digitized control logic for better functionality and high quality output power supply. Digital signal processing (DSP) also provides an efficient communication capability that enhances the flexibility for easy remote control and monitoring.

2.1.2 Advanced design features

- The active power factor correction (PFC) control function continuously corrects the UPS input power factor (PF) to > 0.99, which results in outstanding energy efficiency.
- The wide input voltage tolerance, from 120V~288V, allows the UPS to operate normally without draining the battery unnecessarily during mains under-voltage or overvoltage conditions – which extends the battery service life.
- A DC-start function permits the UPS to be started during a utility power failure if required.
- A revolutionary battery management circuit continuously analyses the battery status during discharge and adjusts the battery cut-off point accordingly – which extends the battery service life.
- Selectable bypass input voltage tolerance (low/high sensitivity) to restrict the range of voltages that can be applied to the load when the UPS operates on bypass.
  The selectable voltage ranges are 184~260V (low sensitivity) and 194~260V (high sensitivity).
- A selection of output voltages (200/208/220/230/240) is available to match the UPS output to local supply specifications or specific load voltage requirements.
- An overload protection system that automatically switches the UPS to bypass mode in the event of an overload that exceeds its rated capacity – and automatically switches back to the inverter mode once the overload condition clears.
- Output short-circuit protection which puts the UPS system in stand-by mode and cuts off the output supply until the short circuit is manually remedied.

2.1.3 PowerWave 1000 Model range

The PowerWave 1000 UPS range compromises 1 kVA, 2 kVA and 3 kVA models, each of which is designed as a self-contained UPS comprising a rectifier, battery charger, inverter, static switch and battery pack. All the models in this range are easy to install, and supplied with suitably terminated mains power cables.

CAUTION: *In spite of their plug-and-play design, it is recommended that the UPS is installed and configured by a suitably trained engineer.*

The PowerWave 1000 operates as a stand-alone UPS module and can be mechanically configured as a floor-standing tower unit or installed in a standard 19 inch rack. An accessory pack which contains all the parts necessary to configure the unit for either type of installation is supplied with the UPS.

An optional external battery cabinet is available to increase the UPS autonomy time. The battery cabinet design compliments the UPS cabinet and the two cabinets can be mechanically connected together to form a single unit when installed as a tower system – see chapter 3 (Installation) for mechanical configuration details.

		1 kVA	2 kVA	3 kVA
Maximum output power	kVA (kW)	1.0 (0.8)	2.0 (1.6)	3.0 (2.4)
Dimensions (WxHxD)	mm	89 x 445 x 405	89 x 445 x 680	89 x 445 x 680
Weight (with standard batteries)	kg	19	30	33
Sound level	dBA	50	50	50

2.2 UPS Operating principle

2.2.1 Basic block diagram

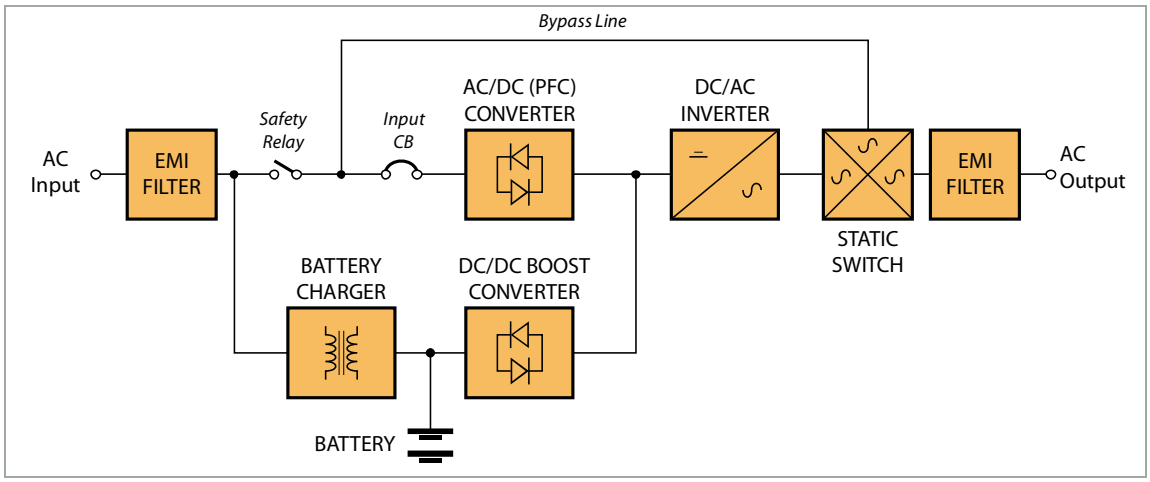


Figure 2.1 UPS Functional block diagram

EMI Filters

The UPS has an input and output EMI filter to reduce the effects of any electromagnetic noise generated by the UPS – e.g. reduces external radio interference.

Battery charger

A regulated battery charger, driven from the utility AC input supply, charges the battery whenever the input supply is available.

DC/DC Boost converter

In times of utility failure, this converter turns on and boosts the battery voltage to a level suitable for use by the inverter. It provides a regulated DC output for the inverter while the battery voltage decays during discharge and includes voltage and current monitoring and overload protection.

AC/DC Converter

As its name suggests, the AC/DC Converter converts the utility AC input supply into a controlled DC supply that is suitable for use by the inverter. The converter uses a leading-edge switched-mode technique which produces an input power factor almost unity over its operating range (0.99 at full rated linear load) and thereby maximises the UPS input efficiency.

The converter can satisfy the inverter DC power demands over a wide utility input voltage range of between 120V~288V which means that the battery is not called upon during power dips (brownouts), thereby maximising battery life and availability.

DC/AC Inverter

The inverter converts the DC voltage connected to its input, from the utility mains supply via the AC/DC converter or from the battery via the DC/DC converter, and produces a regulated AC output voltage suitable to power the connected load equipment. The control logic associated with power block are substantial and, in addition to the output voltage regulation, provides various levels of overload protection, frequency regulation and synchronisation and output voltage error detection.

Static switch

The static switch provides a means of connecting the UPS AC output (load) to either the inverter or the bypass line, which is connected directly to the UPS Utility supply input. The control logic within this power block will transfer the load to the bypass supply in the event of overload or UPS (inverter) malfunction. The load can also be transferred between the inverter and bypass line manually if required. Note that a controlled transfer can take place only if the inverter and bypass line are synchronised in frequency and phase.

2.2.2 System operating modes

ON-LINE operation

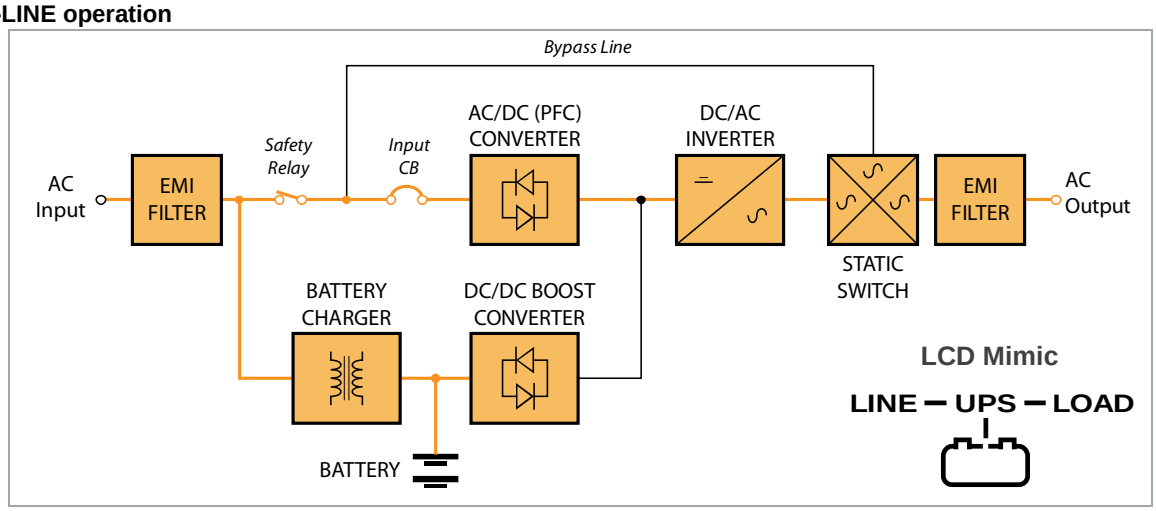


Figure 2.2 ON-LINE operation

- The battery is being permanently charged by the battery charger.
- The AC/DC converter is processing the utility input supply and turning it into controlled DC.
- The Inverter is converting the AC/DC converter output back into AC suitable for the load.
- The static switch is connecting the inverter output to the UPS output terminals.

ON BATTERY operation

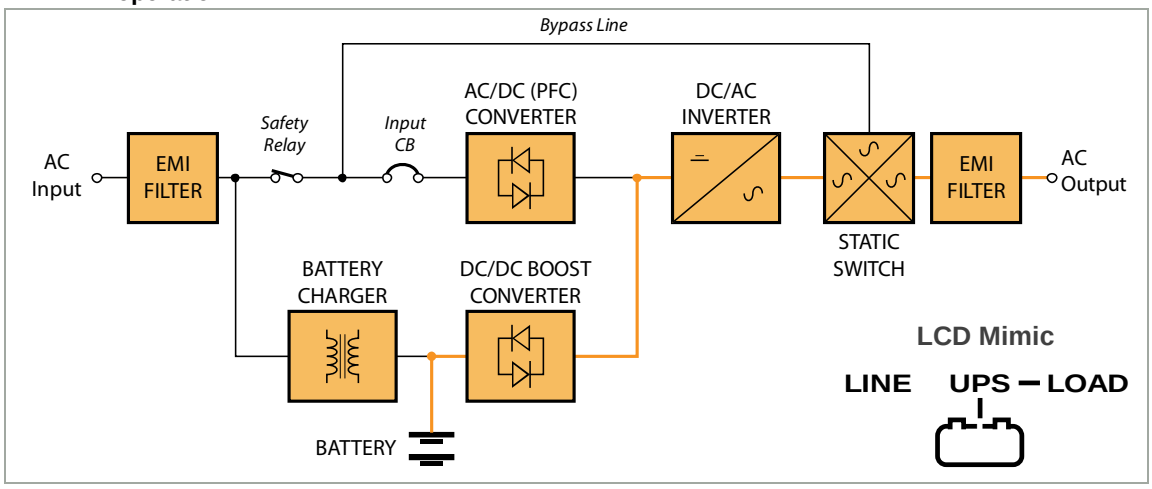


Figure 2.3 ON-BATTERY operation

- The battery is discharging through the DC/DC boost converter which presents the inverter with a controlled input voltage as the battery discharges.
- The Inverter is converting the DC/DC boost converter output back into AC suitable for the load.
- The static switch is connecting the inverter output to the UPS output terminals.
- The load will continue to receive its regulated power until the battery discharges to its low voltage cut-out level.

ON BYPASS operation

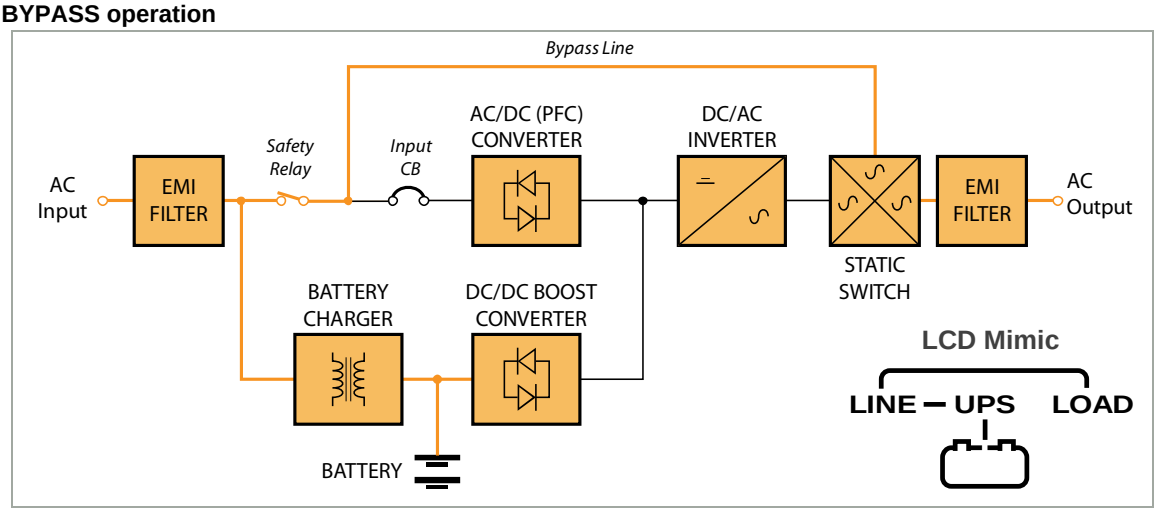


Figure 2.4 ON-BYPASS operation

- The battery is being permanently charged by the battery charger as long as the battery charger is still serviceable and able to operate. If the load has transferred to bypass due to an internal malfunction the battery charger may have shut down.
- The AC/DC converter, DC/DC Boost converter and inverter are all inoperative.
- The static switch is connecting the bypass line to the UPS output terminals.

***Note:** When operating in this mode the load is unprotected from utility power disturbances.*

Frequency changer considerations

The UPS normally switches to the On-bypass mode in the event of a UPS malfunction or overload. However, if the UPS has been configured to operate as a frequency changer, by definition, the output frequency produced by the inverter will not match that of the input supply –e.g. 50 Hz input with 60 Hz output or vice versa.

If the UPS is configured to operate in a frequency changer mode its bypass line connection through the static switch is disabled.

2.3 Operator control panel

The UPS is fully controlled from the operator control panel located on the front of the unit.

The user-friendly UPS control panel comprises three areas:

Led indicators

A row of leds indicate the UPS input and output power status, together with a general fault warning.

Alpha-numeric LCD Display

Provides indication of the UPS operating mode together with the input, output, and battery supply parameters. It also displays error messages and UPS set-up data via a system of configuration menus.

Operator Keypad

The keypad contains 6 keys that are used to navigate through the UPS control menu system and turn the UPS OFF/ON.

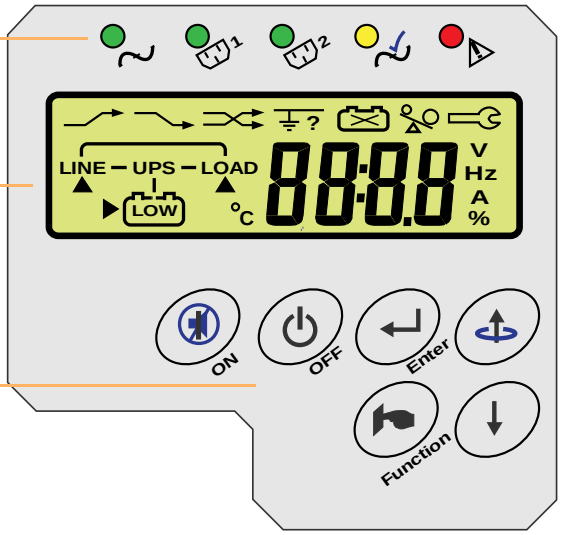


Figure 2.5 Operator control panel

2.3.1 LED Indicators

Input mains supply status
This led is permanently ON (normal condition) if the utility supply is between 168~288 VAC, and flashes if the supply falls to within 120~159 VAC. If the led is OFF it indicates a utility supply failure.

Programmable outlet status
These outlets are normally connected to less critical loads which can be shed when the utility power fails in order to increase the autonomy time for the more critical loads which are connected to the standard UPS outlets.

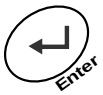
Bypass supply status
This led is permanently ON when the bypass supply is available. The led flashes when the UPS operates in its ON BYPASS mode to indicate that the load is not protected against a utility supply failure.

UPS fault indication
This LED illuminates to indicate a fault condition within the UPS that needs attention.

2.3.2 Operator keypad

ON Button
This button is used to turn ON the UPS, silence the audible alarm, and activate certain other functions when used in conjunction with other buttons (as described later in this chapter). To turn ON the UPS, the button must be held down for approximately five seconds, until two audible beeps are heard.

OFF Button
To turn OFF the UPS, this button must be held down for approximately five seconds, until two audible beeps are heard.



ENTER Button
The ENTER button is used to select a parameter from the UPS configuration setup menus.

UP (BACK) Button
This button is used to navigate UP through the UPS menus. It is also used in conjunction with the ON button to manually transfer the load between the UPS and bypass supply.

DOWN (NEXT) Button
During normal operation, this button is used to scroll through the metered parameters shown on the LCD display. It is also used two navigate forward through the UPS configuration setup menus.

FUNCTION Button
This button is used to access the UPS configurations setup menus.

2.3.3 LCD Display

The LCD has three functional areas that can be broadly described as Warning Symbols, Mimic Diagram and a four digit Alpha-numeric Display. Each of these areas are described individually below.

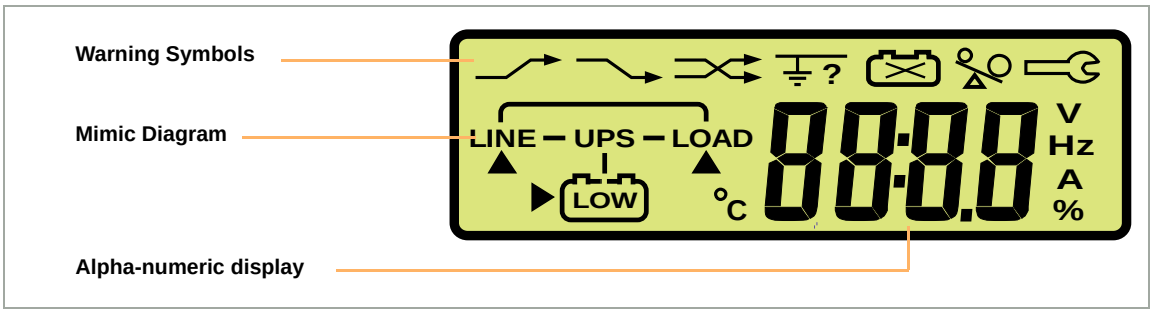


Figure 2.6 LCD Display

Warning symbols

Low battery:
This warning symbol appears if the battery voltage is low.

Battery fault:
This symbol indicates if there is a battery fault.

Overload:
This symbol indicates a UPS overload.

Supply fault:
This symbol indicates an input supply problem, such as reversed Line-Neutral.

Service mode:
This symbol indicated that the UPS is operating in Service mode.

Load transfer
Load transferred to bypass due to loss of UPS Inverter output.

Bypass defective
Bypass input abnormal, UPS fails to transfer to bypass

Utility supply defective
Utility supply defective at the UPS input terminals.

Mimic diagram

LCD Mimic diagram
The LCD Mimic indicates the existing power flow through the UPS. The LINE, UPS, LOAD and BATTERY symbols are permanently shown on screen and their interconnecting lines appear depending on the UPS mode of operation – see below.
Note that the arrowheads shown in Figure 2.7 are used in conjunction with the LCD meter display to identify the source of the meter indication.

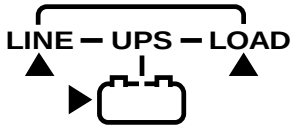
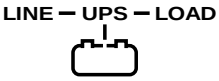


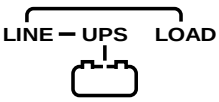
Figure 2.7 LCD Mimic diagram

UPS OFF
This mimic is displayed when the utility power is first applied to the UPS, or if the UPS is turned OFF. It shows that the battery is being charged from the utility (LINE) but the LOAD is isolated from the UPS, and is therefore unpowered.



UPS ON
This mimic is displayed during normal UPS operation. It shows the battery being charged from the utility (LINE) and the LOAD connected to the UPS output – and therefore being supplied with processed, backed-up power.

ON BATTERY MODE
This mimic is displayed if the utility supply fails. It shows the battery now providing the UPS and LOAD power. The battery will sustain the UPS output until it is discharged, whereupon the UPS will shutdown.



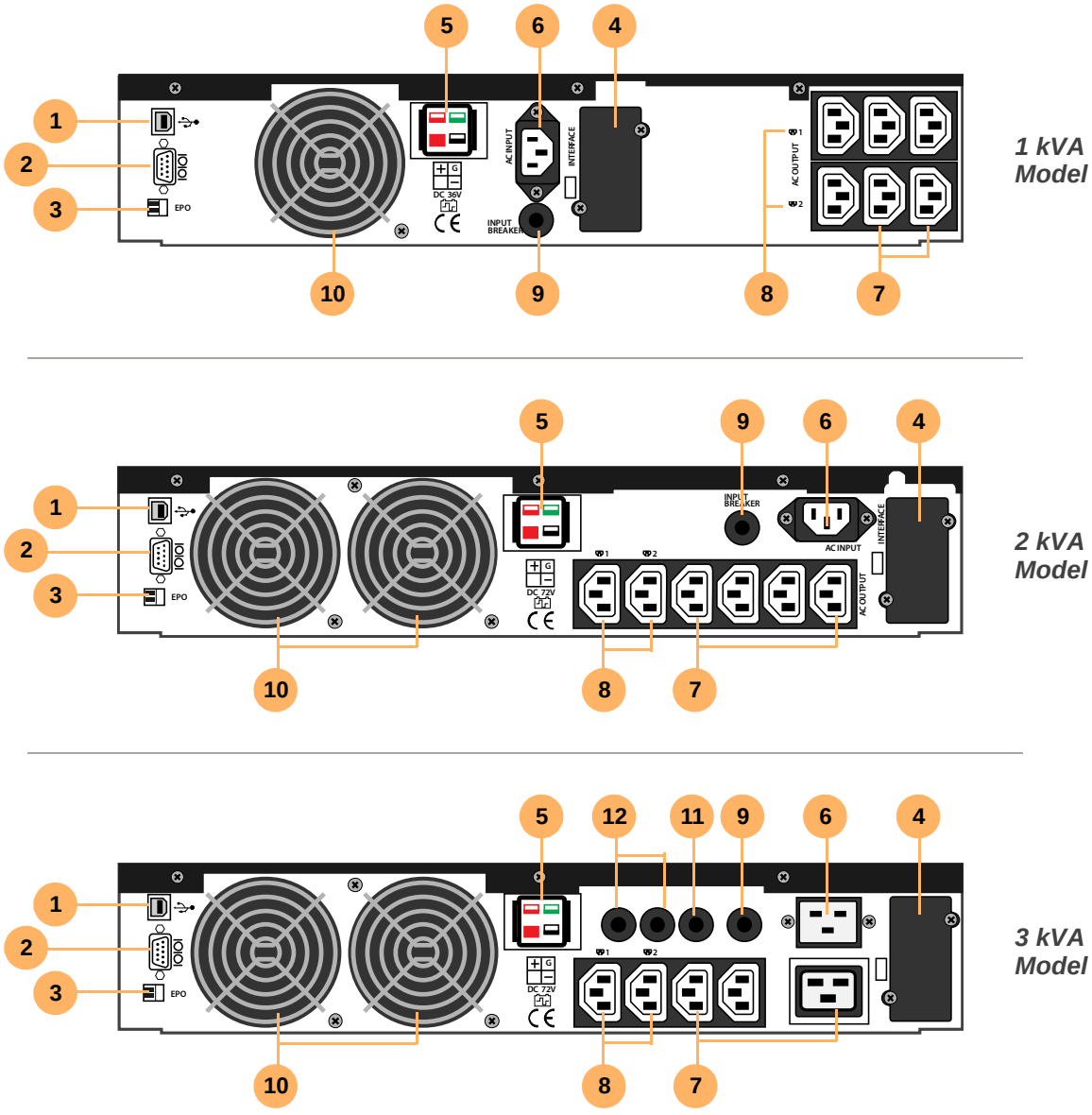
LOAD ON BYPASS MODE
This mimic is displayed if the UPS develops a fault (or is overloaded), whereupon the load is transferred to the bypass line and therefore connected directly to the unprotected utility supply (LINE). The battery will remain on charge if the UPS charger is healthy.
The load can be manually switched between the UPS and Bypass by simultaneously pressing the ON and UP buttons for approximately 5 seconds.

Four digit alpha-numeric display

The four digit alpha-numeric display provides a metering facility which can be selected to show the input voltage/frequency, output voltage/frequency/load together with battery voltage and the internal enclosure temperature. Details of the meter facilities are provided on page 4-3.

A variety of operating status and fault codes are also shown on the display, as described throughout this manual.

2.4 UPS Rear panel



1	USB Port	7	Unswitched AC Outlets
2	RS232 Port	8	Two switched (programmable) AC outlets
3	Emergency Power Off (by dry contact)	9	Mains input supply circuit breaker
4	Communications card options slot	10	Cooling fans
5	External battery connector	11	Output circuit breaker for unswitched outlets
6	Input mains (utility) power socket	12	Output circuit breaker for switched outlets

Figure 2.8 Rear panel detail

2.4.1 Communication Ports

Several communication options can connected to the PowerWave 1000 rear panel. These are described briefly below with further details provided in chapter 7 (Options).

USB port (Figure 2.8 item 1)

A USB type B socket is provided to allow the UPS to be connected to a PC using a standard USB peripheral interface cable. The USB communication protocol complies with USB version 1.0 (1.5 Mbps) and USB HID version 1.0.

This facility can be used in conjunction with the UPS external monitoring and shutdown software (WAVEMON) and with the supplied UPS Configuration Software (see paragraph 7.2).

RS-232 Interface port (Figure 2.8 item 2)

The RS-232 port also allows the UPS to be connected to a PC. It can be used with the UPS external monitoring and shutdown software (WAVEMON) and with the supplied UPS Configuration Software (see paragraph 7.2).

The RS-232 interface should be set as follows:

Baud Rate	2400 bps
Data Length	8 bits
Stop bit	1 bit
Parity	None

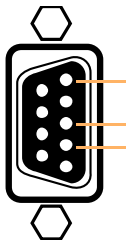


Figure 2.9 RS232

Emergency power off (EPO) (Figure 2.8 item 3)

If an external emergency power off (EPO) facility is required, a normally-open circuit must be connected to the two pin plug located on the rear panel, as shown. When the external circuit is operated it places a short-circuit across these terminals and effects a total UPS shutdown. A plug-in connector with screwed terminal connections is supplied ready fitted to the EPO socket to simplify the connection of the external cable if the UPS is located in a confined space, such as when it is rack mounted.

Optional interface cards (Figure 2.8 item 4)

Four optional interface cards are available to meet various communication needs: DCE (dry contact relay card), R2E, USE and SNMP/Web. These cards can be fitted into the options slot located behind a blanking plate on the UPS back panel, as shown. Full installation and set-up procedures are provided in chapter 7.

The software bundled with the UPS is compatible with most operating systems including Windows 98, 2000, ME, NT and XT. For other applications, such as Novell Netware, Unix or Linux please contact your local dealer for suitable products.

All of the fitted communication ports, including the optional cards, can be active and used simultaneously to monitor the UPS status. However, only one communication (the one with the highest priority) has the ability to command and control the UPS at any given time.

The priority of the communication interfaces are:

1. EPO input port.
2. Optional slot-mounted Dry Contact interface card.
3. USB Port.
4. RS-232.

2.5 Warranty

The PowerWave 1000 UPS is supplied with a limited warranty that the UPS and its component parts are free from defects in materials and workmanship for a period of one year from the date of commissioning or fifteen months from the date of original delivery, whichever is the sooner. This warranty is the only warranty given and no other warranty, express or implied, is provided.

This warranty does not apply to any losses or damages caused by misuse, abuse, negligence, neglect, unauthorised repair or modification, incorrect installation, inappropriate installation environment, accident, act of God, or inappropriate application.

If the UPS fails to conform to the above within the warranty period then Uninterruptible Power Supplies Ltd will, at its sole option, repair or replace the UPS. All repaired or replaced parts will remain the property of Uninterruptible Power Supplies Ltd.

As a general policy, Uninterruptible Power Supplies Ltd does not recommend the use of its products in:

- life support applications where failure or malfunction of the product can be reasonably expected to cause failure of the life support device, or to significantly affect it's safety or effectiveness.
- applications concerned with direct patient care.

Uninterruptible Power Supplies Ltd will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to Uninterruptible Power Supplies Ltd that:

- the risks of injury or damage have been minimized.
- the customer assumes all such risks.
- the liability of Uninterruptible Power Supplies Ltd is adequately protected under the circumstances.

CAUTION: *The UPS contains batteries that must be re-charged for a minimum of 12 hours every three months to prevent deep-discharging. Batteries that have been deep-discharged, for whatever reason, are not covered by this warranty.*

2.6 Extended warranty

The standard warranty may be enhanced by protecting the UPS with an extended warranty agreement (maintenance contract).

An extended warranty agreement enhances the standard warranty by providing the following:

- regular preventative maintenance inspections.
- guaranteed speed of response to operational problems.
- 24 hour telephone support.
- fully comprehensive cover (excluding batteries and capacitors).

Contact the Service Support Hotline on 0800 731 3269 for further details.

2.7 Additional service/maintenance support

In addition to providing support for the PowerWave 1000 UPS, Uninterruptible Power Supplies Ltd can provide maintenance and support on a wide range of different UPS products.

If you are interested in an extended warranty for your PowerWave 1000 UPS, or for any other UPS products you may have, please complete the enquiry form shown on the following page and return or FAX to:

Uninterruptible Power Supplies Ltd.
Woodgate
Bartley Wood Business Park
Hook
Hampshire
RG27 9XA

Tel:	01256 386700 0800 731 3269 (24 Hr.)
Fax:	01256 386701
Email:	service@upspower.co.uk

Fax to: 01256 386701 **www.upspower.co.uk**

Uninterruptible Power Supplies Ltd.
Woodgate
Bartley Wood Business Park
Hook
Hampshire
RG27 9XA
Tel: 01256 386700

Name: .....

Job Title: .....

Company: .....

Address: .....

.....

.....

.....

Post Code .....

Tel. .....

Fax. .....

E-mail .....

Please contact me to discuss:

☐ Extended Warranty options for my PowerWave 1000 UPS

☐ Extended warranty options for my UPS System as below:

Manufacturer:.....

Model Nº:.....

Rating kVA:.....

☐ Replacement Batteries.....

☐ Other .....(please specify)

Thank you for your enquiry, which will receive our prompt attention.
If you need to contact us immediately call free on,

Freefone 0800 731 3269

or E-mail us on service@upspower.co.uk
www.upspower.co.uk

3 Installation and Set-up

CAUTION: *Read the safety information contained in chapter 1 before installing the UPS.*

3.1 Unpacking the UPS equipment

The manufacturer has designed robust packaging for your product to help ensure it reaches you in good order; however, accidents and damage may sometimes occur during shipment. You should inspect the UPS carefully upon receipt and if there are signs of damage you must inform the carrier and dealer immediately.

WARNING: Under no circumstances should you connect electrical power to a damaged unit or attempt to start it using its internal batteries.

The packaging is recyclable; save it for re-use or dispose of it appropriately and correctly.

1. Remove the UPS from the packing carton.
2. Check the package contents. The standard unit includes:
   a) User Manual.
   b) Two IEC output cables.
   c) An AC power cord terminated with a mains plug suitable for the country of use.
   d) A set of UPS communication software complete with RS232 cable.
   e) A mounting accessories kit which allows the UPS/Battery cabinets to be configured for Tower or Rack installation.
3. Before proceeding, check the data plate on the rear of the UPS and verify that the unit's voltage and power ratings comply with the equipment order details, and contact the dealer if this is incorrect.

3.2 Selecting a suitable installation location

As the UPS weighs several kilograms, the location where the UPS is to be installed must meet be able to safely support its weight.

To ensure correct operation and a long service life, always install the UPS in accordance with the following environmental conditions:

- The UPS is not designed for outdoor use.
- The installed location must be dry and free of excessive dust.
- The UPS must not be installed in a corrosive environment or in the vicinity of flammable items.
- The ambient temperature and humidity must be within the limits specified in chapter 8 of this manual.
- The ventilation grills at the front of the UPS and extractor fans at the rear of the UPS must not be obstructed.
- The UPS equipment must be installed with the clearances illustrated in Figure 3.1 as a minimum.

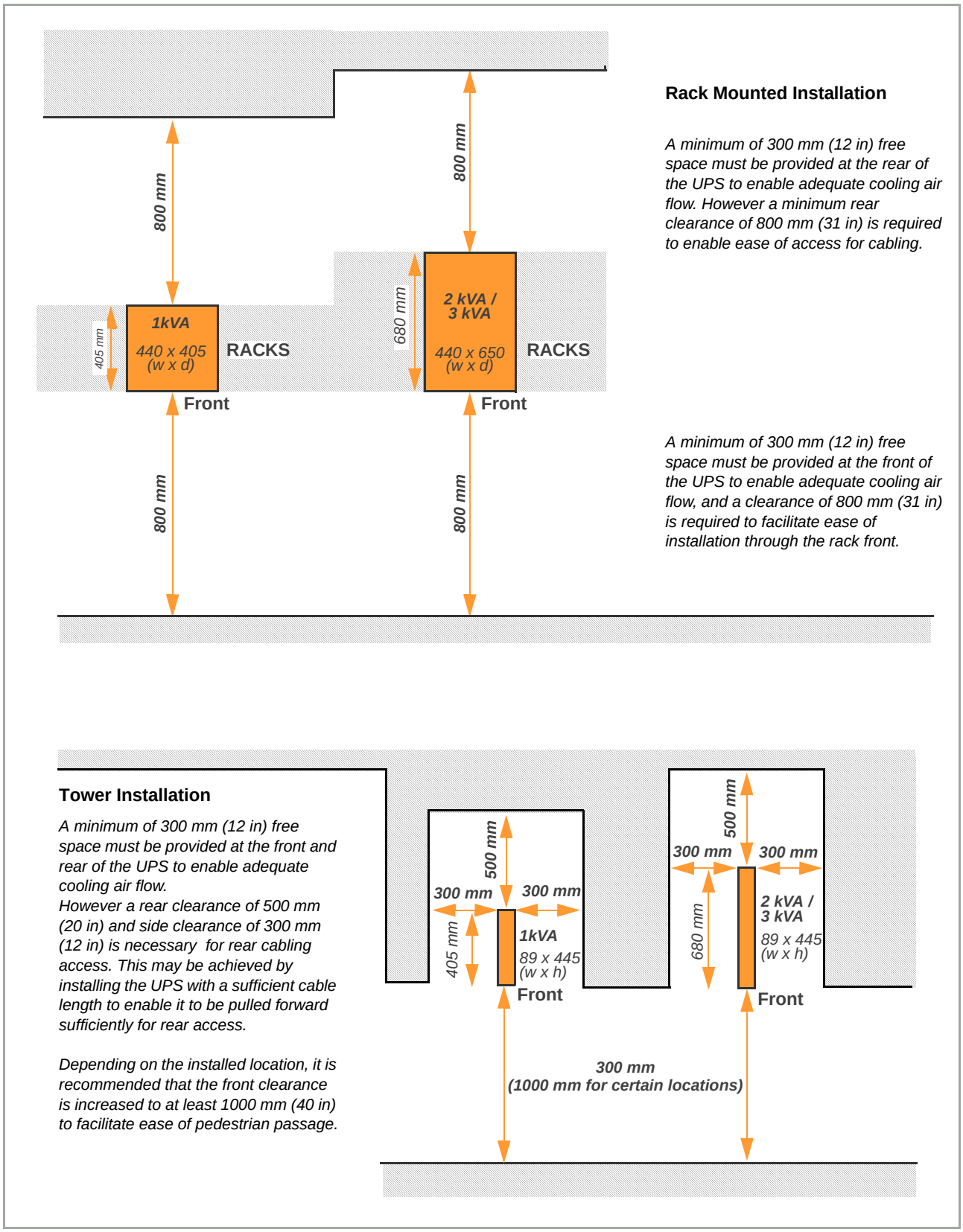
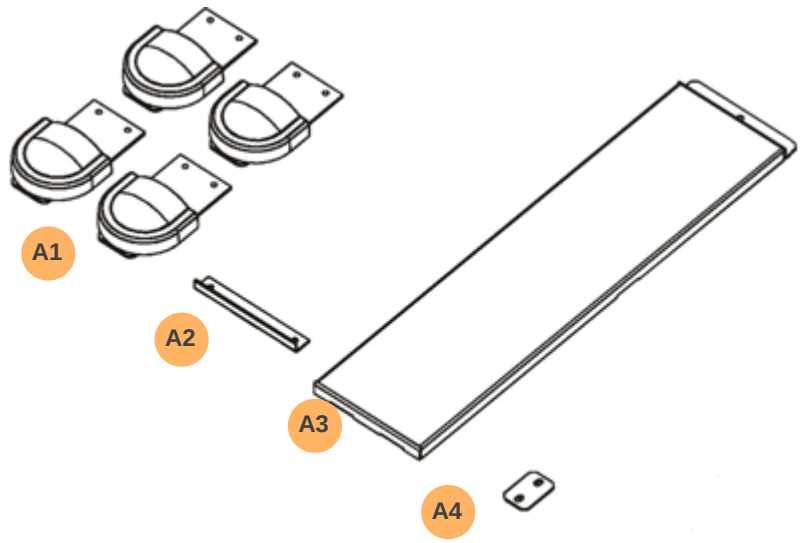

800 mm
800 mm
680 mm
2 kVA /
3 kVA
440 x 650
(w x d)
RACKS
405 mm
1kVA
440 x 405
(w x d)
RACKS
Front
Front
800 mm
800 mm
Rack Mounted Installation
A minimum of 300 mm (12 in) free space must be provided at the rear of the UPS to enable adequate cooling air flow. However a minimum rear clearance of 800 mm (31 in) is required to enable ease of access for cabling.
A minimum of 300 mm (12 in) free space must be provided at the front of the UPS to enable adequate cooling air flow, and a clearance of 800 mm (31 in) is required to facilitate ease of installation through the rack front.
Tower Installation
A minimum of 300 mm (12 in) free space must be provided at the front and rear of the UPS to enable adequate cooling air flow.
However a rear clearance of 500 mm (20 in) and side clearance of 300 mm (12 in) is necessary for rear cabling access. This may be achieved by installing the UPS with a sufficient cable length to enable it to be pulled forward sufficiently for rear access.
Depending on the installed location, it is recommended that the front clearance is increased to at least 1000 mm (40 in) to facilitate ease of pedestrian passage.
500 mm
300 mm
300 mm
405 mm
1kVA
89 x 445
(w x h)
Front
500 mm
300 mm
300 mm
680 mm
2 kVA /
3 kVA
89 x 445
(w x h)
Front
300 mm
(1000 mm for certain locations)

Figure 3.1 Installation clearances

3.3 Tower hardware configuration set-up

Using the components shown in Figure 3.2, which are supplied as standard, the UPS (and separate battery enclosure where used) can be configured as a floor-standing Tower unit, as follows:



All necessary screws and hardware included.

A1 4 x Tower feet

A2 1 x Tower top panel bracket

A3 1 x Tower top panel

A4 1 x Tower / battery cabinet tie bar

Figure 3.2 Tower configuration kit

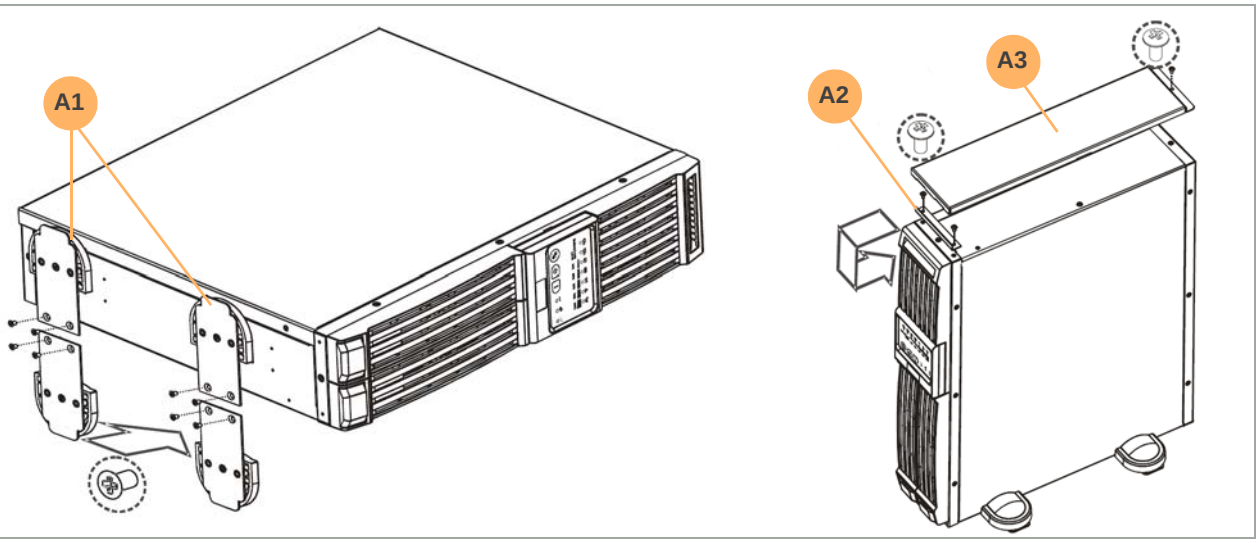


Figure 3.3 Stand-alone UPS tower configuration

3.3.1 Stand-alone UPS module (without external battery cabinet)

1. Turn the UPS on its side and, using the screws provided, attach the four tower feet (A1) to the base of the enclosure as shown in Figure 3.3.
2. Carefully lift the assembly and stand it on its feet.
3. Remove three screws from the top of the UPS enclosure, as shown in Figure 3.3 right-hand diagram.
4. Attach angle bracket (A2) to the top front of the enclosure, using two screws, such that the lip of the bracket faces the front of the UPS.
5. Locate the new UPS top panel (A3) into the bracket and secure it in place by screwing it to the top rear of the UPS enclosure using a single screw.

6. If necessary, rotate the UPS control panel so that it is correctly orientated. To achieve this, carefully pull the control panel forward to unclip it from its mounting, rotate it to the correct angle, then relocate it and press it back into place.
7. This completes the tower hardware configuration. The UPS should now be commissioned as detailed in paragraph 3.5.1 before it is put into service.

3.3.2 UPS module with external battery cabinet

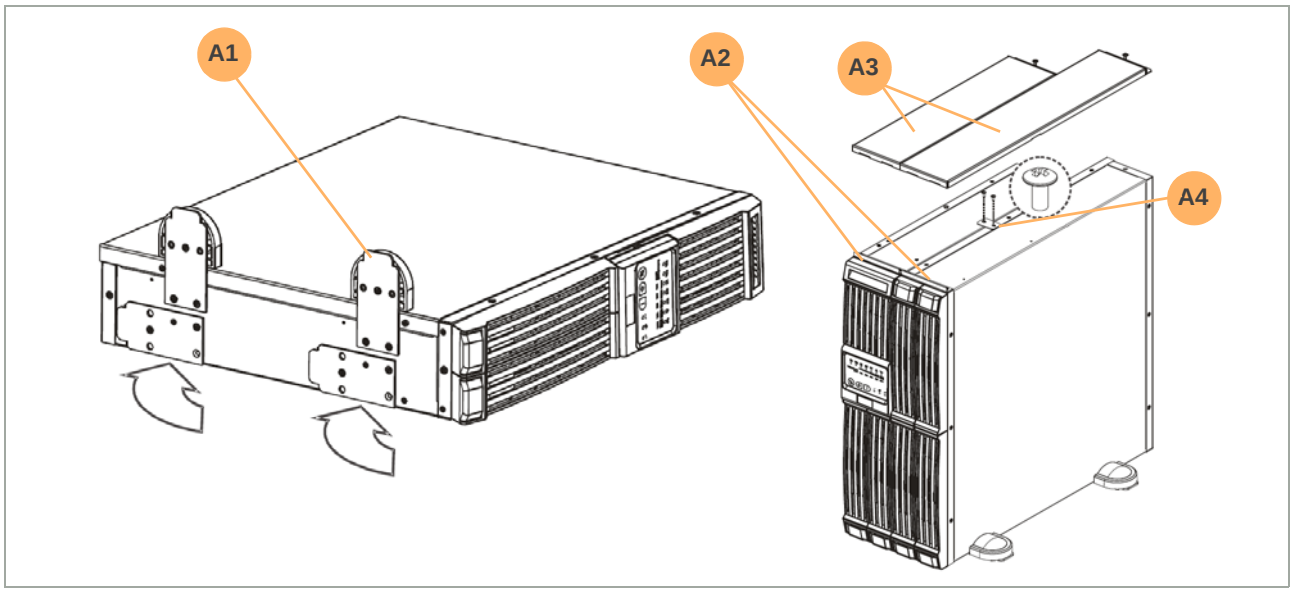


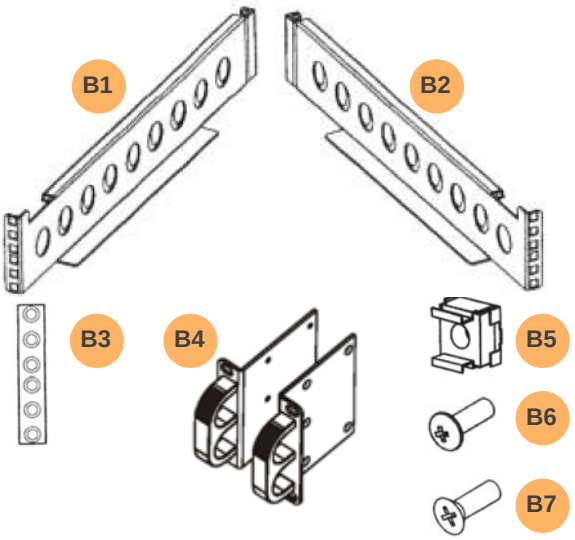
Figure 3.4 Stand-alone tower configuration with external battery.

This is similar to the preceding procedure. Note that the external battery enclosure is of a similar mechanical design to the UPS enclosure and comes complete with its own rack/tower hardware configuration kit. The battery cabinet is secured to the right of the UPS (when viewing from the front) as follows:

1. Turn the UPS on its side and attach two tower feet (A1) as shown in Figure 3.4 to the left hand side of the enclosure base.
2. Remove the sole plates from the two remaining tower feet and fit them to the base of the UPS so that they do not protrude from the side of the enclosure (see Figure 3.4). This is done to ensure the UPS base stands level when it is turned back on its feet.
3. Repeat steps 1 and 2 on the base of the battery enclosure, ensuring that the protruding feet are fitted to the enclosure's right hand side.
4. If necessary, rotate the UPS control panel so that it is correctly orientated. To achieve this, carefully pull the control panel forward to unclip it from its mounting, rotate it to the correct angle, then relocate it and press it back into place.
5. Carefully lift both assemblies and stand them on their feet adjacent to each other, with the battery enclosure standing to the right of the UPS enclosure.
6. Remove three screws from the top of the each enclosure (two from the front and one from the back), as shown in Figure 3.4 right hand diagram.
7. Fit the tie bar (A4) between the two enclosures to secure them together (after removing the necessary screws from the tops of the enclosures).
8. Attach the angle brackets (A2) to the top front of the UPS enclosure, using two screws, such that the lip of the bracket faces the enclosure's front.
9. Locate the new UPS enclosure top panel (A3) into the bracket and secure it in place by screwing it to the top rear of the enclosure using a single screw.

10. Repeat the previous 2 steps to fit the new top panel to the battery cabinet.
11. Connect the interconnecting battery cable (supplied) between the UPS and battery enclosure. Note that you may have to remove the safety cover on the back of each unit to gain access to the battery connector.
12. This completes the tower+battery hardware configuration. The UPS should now be commissioned as detailed in paragraph 3.5.1 before it is put into service.

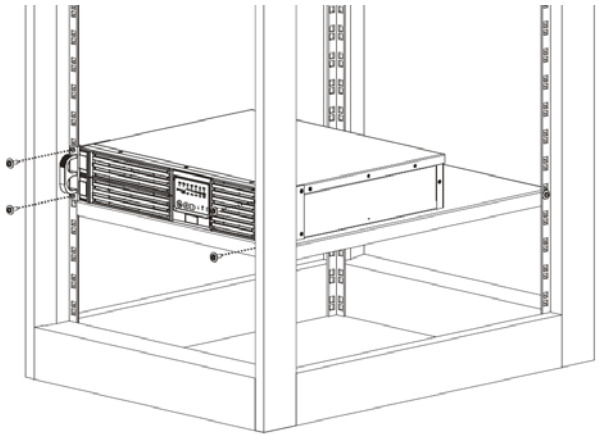
3.4 Rack configuration set-up



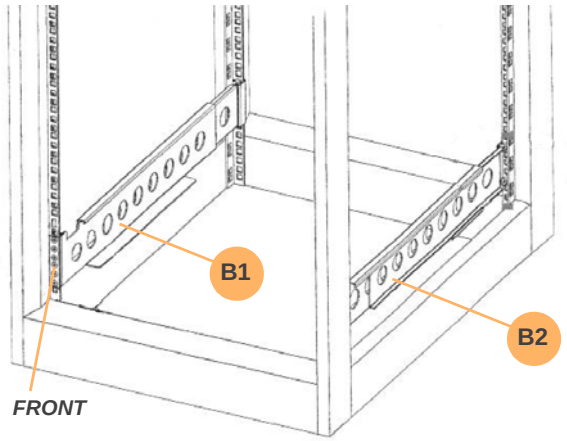
B1 1 x Adjustable mounting rail (Left)
B2 1 x Adjustable mounting rail (Right)
B3 2 x Adapter plate
B4 2 x Rack mounting handle
B5 12 x Captive nuts
B6 8 x Dome head bolts
B7 4 x Countersunk bolts

Figure 3.5 UPS Rack mounting kit

The PowerWave 1000 UPS and battery enclosure(s) can be installed in a standard 19 inch rack, and can be either shelf mounted or installed on adjustable mounting rails that are provided as part of the rack installation kit. If the batteries are housed in a separate enclosure, it should be mounted on an adjacent shelf in the same rack using same procedure as mounting the UPS. The two enclosures are then later connected together using the supplied interconnecting cable.



Shelf mounting



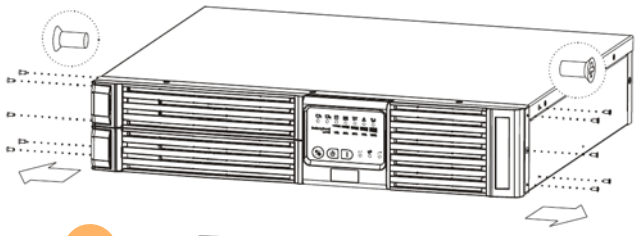
Adjustable mounting rails

Figure 3.6 Rack mounting options

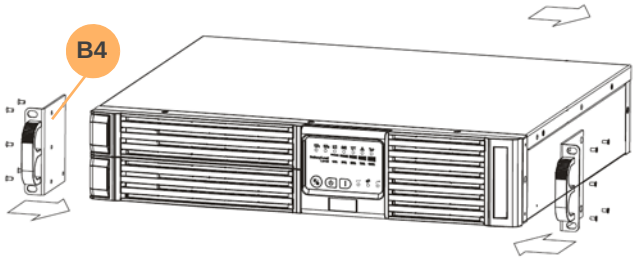
3.4.1 Installing the adjustable mounting rails

The adjustable mounting rail kit contains a pair of mounting rails (left and right handed) that are fitted to each side of the cabinet and secured by two screws – front and back. The rails can be extended to any length between 543 mm and 925 mm and are compatible with most standard 19 inch rack assemblies of 600 mm to 900 mm depth.

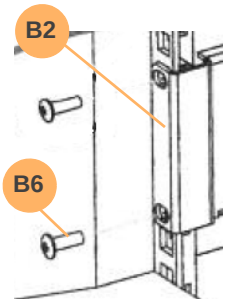
1. Remove five screws from the front of both sides of the UPS.



2. Attach a mounting handle assembly (B4) to both sides of the UPS enclosure, using the holes vacated in the previous step to secure the handles in place.



3. Extend the adjustable mounting rail and hold in place (see Figure 3.6).
4. Align the two holes in the back of the adjustable mounting rail with the holes in the cabinet's vertical fixing rail.
5. Identify and mark the two vertical fixing rail holes to which the adjustable mounting rail is to be fixed.
6. Clip captive nuts (B5) to the two vertical fixing rails holes identified above.
7. Secure the rear of the adjustable mounting rail to the vertical fixing rail using two dome headed bolts (B6).



8. With the rear of the adjustable mounting rail secured in place, and the adjustable mounting rail extended, identify the four fixing points that will align with the equipment mounting handles and clip four captive nuts to the required fixing points.

Note: *The fixing points will vary according to the equipment height (2U, 3U, 4U) as shown in Figure 3.8.*

9. Secure the adjustable mounting rail to the rack's front vertical fixing rail using two countersunk bolts (B7) and adapter plate (B3) *(see Figure 3.8).*
10. Repeat the steps 1 to 9 above to fit the second adjustable mounting rail.

WARNING: The UPS / Battery enclosure is heavy. When lifting the equipment ensure that adequate manpower is available and any mechanical lifting aids are suitable for the weights involved.

WARNING: When inserting the enclosure into the rack ensure that it is held level. If it is inserted at an angle it could pivot about the back of the mounting rail runners if the front of the enclosure is tilted upwards.

11. When both mounting rails are fitted, carefully insert the UPS / Battery enclosure into the rack so that it rests correctly on the rails. Then secure it in place using the four dome head bolts (B6) as shown in *Figure 3.8.*
12. The UPS should now be commissioned as detailed in paragraph 3.5.1 before it is put into service.

Figure 3.7 Adjustable mounting rail installation

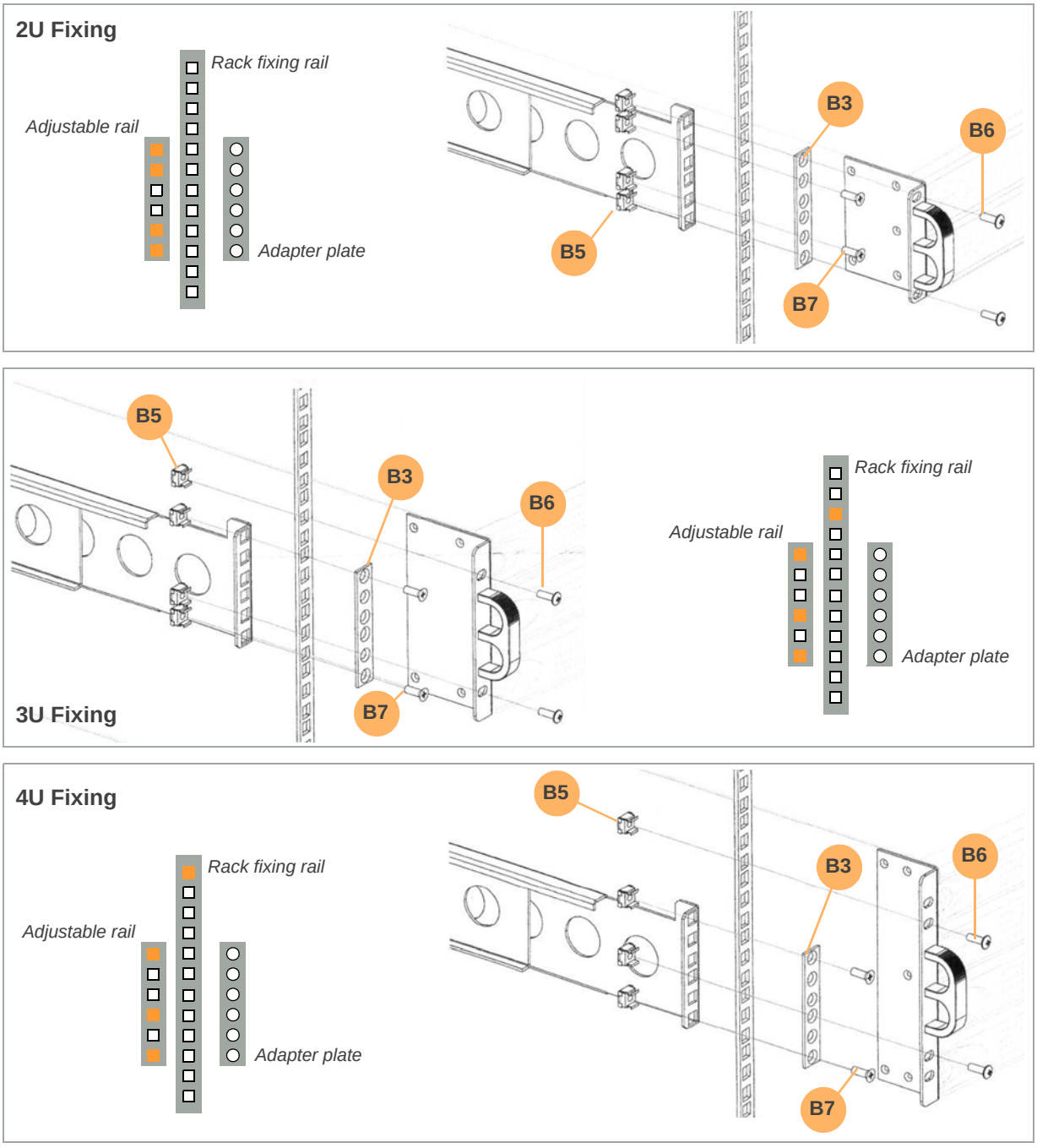


Figure 3.8 Fixing points for captive nuts

Once the UPS has been installed, if necessary, rotate the UPS control panel so that it is correctly orientated. To achieve this, carefully pull the control panel forward to unclip it from its mounting, rotate it to the correct angle, then relocate it and press it back into place.

3.5 Electrical configuration

3.5.1 Commissioning procedure

Before the UPS is put into service, it should be configured to suit the local electrical supply and load application. This can be considered a 'once-only' commissioning procedure and, once completed, will only need to be repeated if the application requirements change.

***CAUTION:** Before you carry out this procedure you must be familiar with the Operator Control Panel functions and the rear panel connections (see paragraph 2.3 and paragraph 2.4). You should also be familiar with the safety information contained in Chapter 1.*

1. Verify that the UPS power outlets are not connected to any load.
2. Check that the utility supply voltage matches the input voltage range specified on the UPS data plate.
3. Connect the UPS input power cable to the utility supply, turn ON the utility supply and close the input circuit breaker located on the rear of the UPS.
   a) The LCD Display will turn on and all of its symbols will illuminate for approximately 3 seconds.
   b) The status leds will all turn on for approximately 3 seconds and then extinguish except for the utility input supply (green) and bypass supply (amber) leds, which will remain lit.
   c) The LCD panel will indicate that the battery is on charge and the UPS is oFF.
4. Simultaneously press and hold the ON and DOWN buttons for 3~5 seconds, until a beep is heard, and then release them.
   a) The LCD will display b_on. This indicates that the UPS is now in its set-up mode.

Bypass voltage window

5. Press the DOWN button twice.
   a) The LCD indication will scroll through bnon and end up showing either S_Lo or S_HI. This indicates the applied bypass voltage window.
   S_Lo sets the bypass window to 184~260 VAC and S_HI sets it to 195~260 Vac.
6. Press the UP button to select the wanted bypass voltage window (either S_Lo or S_HI is displayed).

Inverter frequency sync window

7. Press the DOWN button.
   a) The LCD indication will now show either St01 Hz or St03 Hz. This indicates the permitted bypass frequency window to which the UPS inverter will synchronise.
   St01 Hz sets the frequency window to ±1 Hz and St03 Hz sets it to ±3 Hz.
8. Press the UP button to select the wanted bypass frequency sync window.

Inverter output voltage

9. Press the DOWN button.
   a) The LCD indication will now show either o200 V, o208 V, o220 V, o230 V or o240 V.
   b) Press the UP button to select the required output voltage.

Input/Output frequency changer mode

The UPS can be configured to operate as either a 50/60 Hz or 60/50 Hz frequency changer.

***Note:** When operating in a frequency changer mode the bypass supply is disabled.*

10. Press the DOWN button.
    a) The LCD indication will now show either norL, c50 Hz or c60 Hz.
    norL = normal operation with 50 Hz input and output (default),
    c50 Hz = 60/50 Hz frequency changer, and c60 Hz = 50/60 Hz frequency changer.
    b) Press the UP button to select one of the frequency changer modes if required.

Inverter output fine adjustment

11. Press the DOWN button.
    a) By default, the LCD indication will now show oA 0 %.
    b) If you want to trim the output voltage, press the UP button to cycle through the available options and select the required value – oA 1 %, oA 2 %, oA 3 %, oA-1 %, oA-2 %, oA-3 %.

Confirm & Save

12. Press the DOWN button.
    a) The LCD indication will now show SAvE.
    b) If you want to double-check all the selected values you can scroll through the above list of parameters by repeatedly pressing the DOWN button and make any necessary further changes.
    c) Once you are satisfied that all the selected values are correct, with SAvE shown on the LCD display press the ENTER button to store the selected values in the UPS memory.
    d) The LCD panel will revert to indicate the battery is on charge and UPS is oFF.

Note: *Once the configuration has been saved you must turn OFF the UPS and temporarily turn off the input utility supply before you can access the setup mode again using the ON and DOWN buttons. This is a safety measure designed to prevent the UPS operating parameters from being changed while it is on-line.*

3.5.2 Initial UPS power-up

1. The optional UPS communications cards can be fitted at this point or installed later, as required (see chapter 7 for option card details).
2. Turn ON the UPS as described in paragraph 4.1.1.
3. Check all metered parameters to ascertain that the indications are correct (see page 4-3).
4. Leave the battery on charge for 4 hours.

   Note: *You can charge the batteries with the UPS output turned OFF as long as its utility input supply is connected and turned ON.*
5. Carry out a battery test, as described in paragraph .
6. If the battery test is successful, the UPS can now be put into service.

CAUTION: *It is recommended that the battery is charged for further 4 hours before connecting any critical load. This is to ensure that the battery is charged to a level that enables the UPS to perform to full specification.*

3.6 UPS Setting tool

The UPS Setting Tool is a software application supplied with the PowerWave 1000 which enables you to set-up certain UPS basic operating parameters and configure the programmable power outlets.

The operating parameters can also be set-up from the UPS control panel, as described in paragraph 3.5.1, but the UPS Setting Tool provides the only means of controlling the programmable power outlets.

In order to use the UPS Setting Tool you must connect an RS232 serial cable between the UPS COM port and computer on which the application is installed – with the computer COM port configured as described in paragraph 2.4.1.

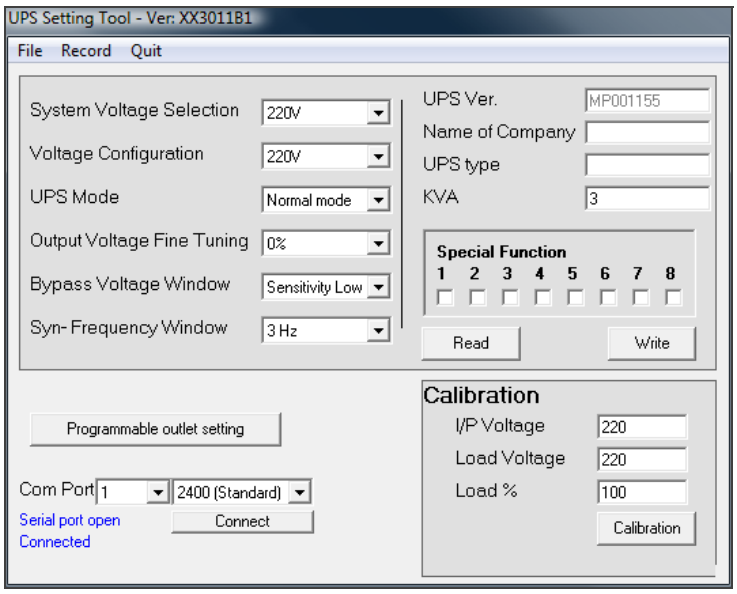
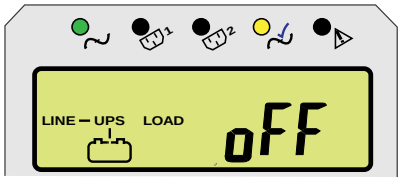
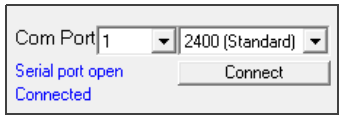


Figure 3.9 UPS Setting tool

3.6.1 Establishing communication

1. Connect the RS232 serial cable between the computer and UPS.
2. Turn ON the UPS input supply but DO NOT press the UPS control panel ON button.
   a) The UPS will run through its start-up self tests and then adopt its oFF status.
3. Run the UPS Setting Tool application on the computer.
4. Select the appropriate Com Port in the UPS Setting Tool.
   a) A communication link should establish automatically, but press the Connect button if necessary to force the connection.
   b) The Serial port open and Connected status messages should appear.

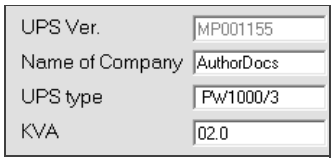




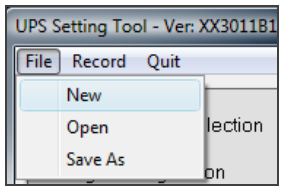
3.6.2 Generating a UPS profile and data file

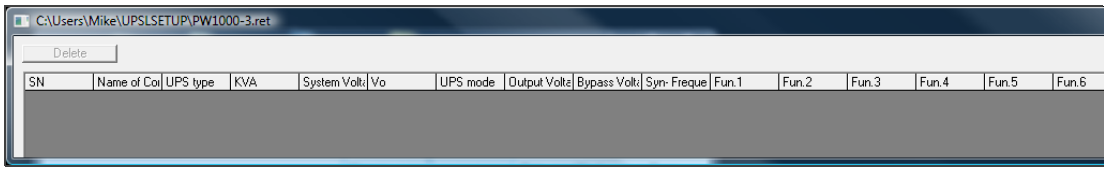
The UPS settings you apply through this tool can be saved to a data file on your computer for later recall. This allows you to observe the changes you've made over time, and provides an easy way to restore a previous configuration profile if required. This procedure shows you how to set up a data file for the specific UPS machine, then generate a configuration data record and access the file to observe the configuration history.

1. In the top right-hand corner of the UPS Setting Tool enter some unique details to identify the connected UPS.
2. Click the Write button to send the identification data to the UPS, where it will be stored in memory.
   a) Click the Yes button in the Writing?? confirmation dialog.
   b) The UPS will beep twice to confirm that it has received the data.
   c) Click OK to clear the Transmit OK dialog.

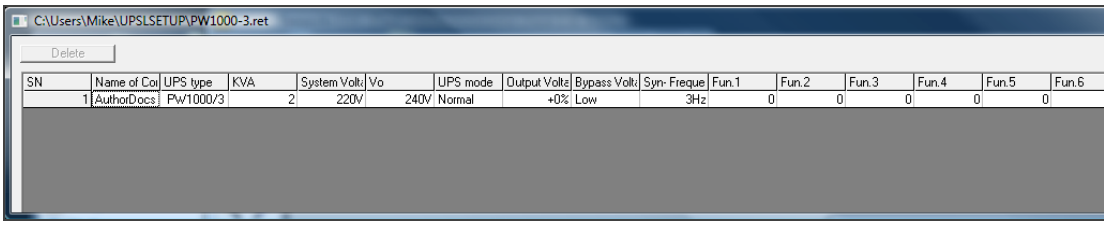


3. In order to save the machine identification data to the UPS memory, you must now reset the UPS by turning OFF its input supply then turning it back ON again.
4. At any time when the UPS is re-started you can download the data held in the UPS memory by clicking the Read button. This will then populate the UPS Setting Tool fields with the stored values.
5. To set up a new data file, click File>New from the menu bar.
6. Using standard Windows file navigation methods, select the directory in which you want to save the file, enter a filename, and click the Open button to save the file.
   a) The file will be save with a .ret filetype.
7. If you now open the file (using File>Open from the menu bar) you will see an empty data file, as shown below.





8. To add a record for the current configuration data, select Record>Add New from the menu bar.
9. The new record will now be shown in the data file – see below.
   Notice that the Name of Company and UPS type details are shown in the first two fields to identify the associated UPS machine.

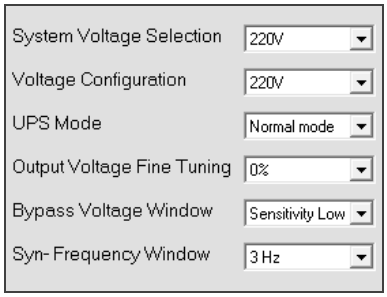


10. In order to associate the data file with the connected UPS you must now once again turn OFF the UPS input supply then turn it back ON again. This will store a reference to the data filename in the UPS memory and allow quick access when you want to open the file in the future.
11. To close the data file click the standard Close button [X] in the top right of the window.

3.6.3 Setting up the basic UPS operating parameters

The UPS Setting Tool allows you to set up several basic UPS operating parameters.

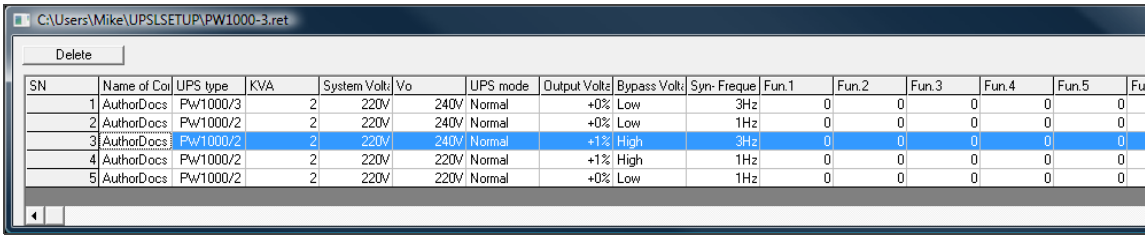
1. Select the required parameters using the drop-down selector boxes (*default):
   a) (Input) System Voltage Selection – 220V*, 110V.
   b) (Output) Voltage Configuration – 200V, 208V, 220V*, 230V, 240V.
   c) UPS Mode – Normal mode (50Hz input/output), CF50 (50Hz/60Hz input/output), CF60 (60Hz/50Hz input/output).
   d) Output Voltage Fine Tuning – +3%, +2%, +1%, 0%*, -1%, -2%, -3%.
   e) Bypass Voltage Window – Sensitivity Low*, Sensitivity High.
   f) Syn-Frequency Window– 3Hz*, 1Hz.



2. Once all the parameters have been selected, click the `Write` button to send the data to the UPS.
   a) Click the `Yes` button in the `Writing??` confirmation dialog.
   b) The UPS will beep twice to confirm that it has received the data.
   c) Click `OK` to clear the `Transmit OK` dialog.
3. In order to apply the changes you must now turn `OFF` the UPS input supply then turn it back `ON` again.

3.6.4 Managing the UPS data file

You can open the UPS configuration data file stored on your computer at any time using `File>Open` from the menu bar, as described in paragraph 3.6.2. An example data file is shown below. When the file is open you can select a record by clicking anywhere in the record line – a selected record is highlighted blue.



SN	Name of Co	UPS type	KVA	System Volt	Vo	UPS mode	Output Volt	Bypass Volt	Syn- Freque	Fun.1	Fun.2	Fun.3	Fun.4	Fun.5	Fu
1	AuthorDocs	PW1000/3	2	220V	240V	Normal	+0%	Low	3Hz	0	0	0	0	0	
2	AuthorDocs	PW1000/2	2	220V	240V	Normal	+0%	Low	1Hz	0	0	0	0	0	
3	AuthorDocs	PW1000/2	2	220V	240V	Normal	+1%	High	3Hz	0	0	0	0	0	
4	AuthorDocs	PW1000/2	2	220V	220V	Normal	+1%	High	1Hz	0	0	0	0	0	
5	AuthorDocs	PW1000/2	2	220V	220V	Normal	+0%	Low	1Hz	0	0	0	0	0	

Adding a new record to the UPS data file

1. As described above, to add the current configuration to the UPS data file, select `Record>Add New` on the UPS Setting Tool menu bar.
   a) The new record will be added to the bottom of the data file.

Updating an existing UPS data file record

To update an existing data file record with configuration data displayed in the UPS Setting Tool:

1. Open the UPS data file.
2. Select the particular record that you want to update.
3. Click the `Unlock` button that appears between the `Read` and `Write` buttons on the UPS Setting Tool.
4. Ensure that the UPS Setting Tool contains the required update data.
5. Select `Record>Update` from the UPS Setting Tool menu bar.
   a) Click the `Yes` button in the `Update??` confirmation dialog.
   b) The UPS data file record will now be updated.

Applying configuration data from an existing record

Use this procedure to set up the UPS using data obtained from an existing data file record.

1. Open the UPS data file.
2. Select the data record that you want to apply to the UPS.
3. Click the `Unlock` button that appears between the `Read` and `Write` buttons on the UPS Setting Tool.
4. The UPS Setting Tool data fields will now be populated with data retrieved from the selected data record.
5. Click the `Write` button to send the data to the UPS.
   a) Click the `Yes` button in the `Writing??` confirmation dialog.
   b) The UPS will beep twice to confirm that it has received the data.
   c) Click `OK` to clear the `Transmit OK` dialog.
6. In order to apply the changes you have made you must now turn `OFF` the UPS input supply then turn it back `ON` again.

3.6.5 Setting up the programmable power outlets

The two programmable power outlets located on the UPS back panel can be programmed to turn ON or OFF under certain circumstances. This feature is typically used to turn off any non-critical loads connected to these outlets when the UPS is operating on battery power, and so increase the battery autonomy time. A green LED illuminates on the UPS control panel to indicate when the outlets are live.

Each of the two outlets can be set-up individually through the Programmable Outlook Scheme window illustrated in Figure 3.10.

This window has two areas; the top, Programmable Outlet Settings area, allows rules to be applied to determine when the programmable outlets are turned ON and OFF. The lower area allows provides a means of manually controlling the outlets' ON/OFF status when the UPS is operating.

***Note:** There is no other means of applying these settings other than through the UPS Setting Tool software.*

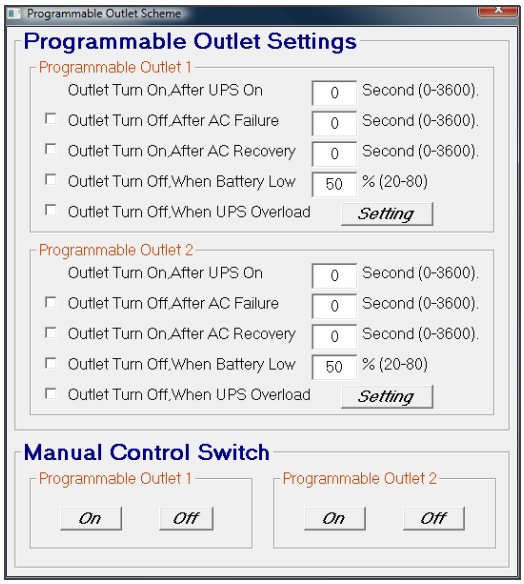


Figure 3.10 Programmable outlets settings

The available programmable outlet settings are:

- **Turn Outlet On, After UPS On –**
  This option sets a delay between the UPS being turned ON and the enabling of the programmable outlet. The set time can be between 0-3600 seconds, and when set to 0 seconds the outlet is enabled immediately after the UPS is turned ON.
- **Outlet Turn Off, After AC Failure –**
  This option sets the time that the programmable outlet remains turned ON following a UPS input mains supply failure. If only non-critical loads are connected to the programmable outlet, this allows them to be shed following an input supply failure in order to achieve a longer back-up time for the critical loads that connected to the standard UPS outlets. The set time can be between 0-3600 seconds, and when set to 0 seconds the outlet is disabled immediately following a supply failure.
- **Outlet Turn On, After AC Recovery –**
  This option sets a time delay before the programmable outlet turns ON following the recovery of the UPS input mains supply from an outage. The set time can be between 0-3600 seconds, and when set to 0 seconds the outlet is enabled immediately after the input supply is restored.

  Key Point: If you set the programmable outlet to turn OFF after an input supply failure, the outlet will not turn back on again when the supply is restored unless you tick the 'Outlet Turn On, After Recovery' check box.

- **Outlet Turn Off, When Battery Low –**
  When the UPS is operating on battery power, this option is used to set the point at which the programmable outlet is switched OFF during the battery discharge. Once again this is to prolong the available battery autonomy time by shedding less critical loads. The level of operation can be set to 20%-80% of remaining charge.
- **Outlet Turn Off When UPS Overload –**
  This option is used to determine if the programmable outlet is turned OFF during overload conditions.

Programmable Outlet Settings

You can change programmable outlet settings at any time irrespective as to whether the UPS is oFF or operating on-line. There is no need to shutdown the UPS to apply any changes made.

This procedure can be used to set-up either/both programmable outlets.

1. Click the Programmable outlet setting button on the UPS Setting Tool window.
   a) The Programmable Outlook Scheme window will open in front of the UPS Setting Tool.
2. To change a particular operating function, tick (or clear) the check box to the left of the function and enter a value if required.

   ***Note:** Enter numerical values only.*
3. Activate the change by clicking the Setting button.
   a) The UPS will respond with two beeps to acknowledge receipt of the data.
4. When all changes have be made, close the Programmable Outlook Scheme window by clicking the standard Close button [X] in the top right corner of the window.

   ***Note:** If the window re-opens, select it closed for a second time.*

Manual Control Switch

The manual control buttons can be used to turn ON/OFF the their respective programmable outlets while the UPS is operating in a live environment. The operation of these buttons is not stored in memory – i.e. if you turn OFF a programmable outlet and then shut down the UPS, when the UPS is restarted the programmable outlet will turn ON immediately, as standard (unless there is a programmed delay).

This procedure can be used to turn ON/OFF programmable outlets individually.

1. Click the Programmable outlet setting button on the UPS Setting Tool window.
   a) The Programmable Outlook Scheme window will open in front of the UPS Setting Tool.
2. Click the programmable outlets' ON or OFF buttons as required.
3. Click Yes in the confirmation dialog box.
   a) The UPS will respond with two beeps to acknowledge receipt of the change.
4. When the changes have be made, close the Programmable Outlook Scheme window by clicking the standard Close button [X] in the top right corner of the window.

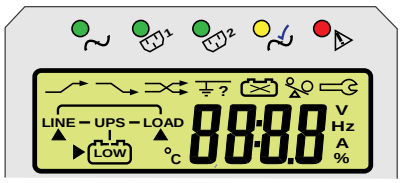
   ***Note:** If the window re-opens, select it closed for a second time.*

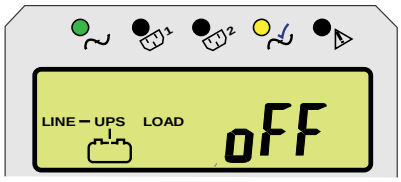
4 Operating Procedures

4.1 Start-up procedures

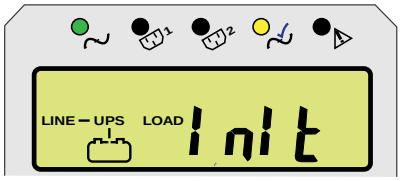
4.1.1 Normal start-up (with mains available)

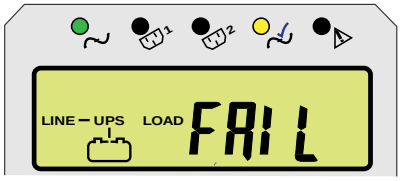
1. Connect the UPS to the utility mains power receptacle using the power cable supplied.
2. Turn ON the UPS mains supply and close the input supply circuit breaker located on the back of the UPS.
   a) The UPS fans will start.
   b) The UPS control system will boot-up and initially turn on all the leds and LCD symbols for a few seconds.
   c) Once the control system has booted, the programmable power outlet leds and warning led will extinguish, leaving only the input mains power led (green) and bypass power led (amber) illuminated.
   d) The battery will begin charging, as indicated on the UPS mimic, and the UPS output status will be shown as oFF.



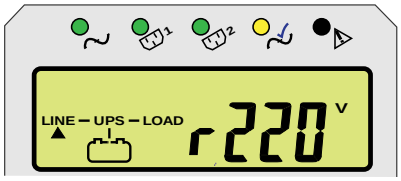


3. Press and hold the UPS ON button for approximately 3~5 seconds until you hear two beeps, then release it.
   a) The UPS will run an initialisation self-test routine, with InIt shown on the LCD.
   b) The audible alarm will sound intermittently but may be silenced by pressing the alarm silence (ON) button.
   c) If the UPS does not complete its initialisation self test successfully the LCD will shown a FAIL message.
   d) If the UPS boots up successfully the LCD mimic display will show that the UPS is operating on line and the input voltage will be indicated on the LCD meter.
   e) The input power and bypass power LEDs will remain lit together with the programmable output sockets LEDs which will now also illuminate (green) to show that these two output are now live.





4. Check all metered parameters to ascertain that the indications are correct (see page 4-3)



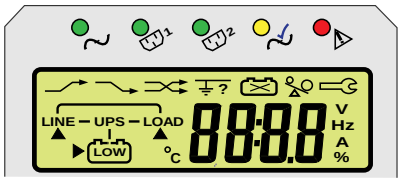
CAUTION: *When turning on the UPS for the first time, or following a long shut down period, leave the unit running for at least eight hours to fully charge the batteries.*

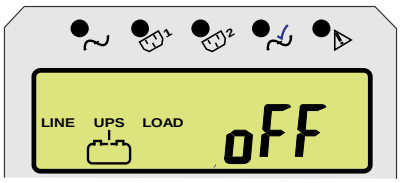
4.1.2 Start-up on battery mode (cold start)

In the absence of the utility power supply, the UPS can be started from its internal batteries – sometimes referred to as a "cold start". This is only possible if the batteries are well charged – to a minimum of 33.5V in the case of a 1 kVA unit and 67V for the 2 kVA and 3 kVA units. This is achieved if the batteries have been charged for a minimum of 4 hours.

Note: *Read through this procedure before you attempt to carry it out. In a part of this procedure you have to press the ON button twice within a one second period. If you take longer than one second between presses the UPS will not start and you will have to turn it OFF, by pressing the OFF button, before you can make another attempt to start it.*

1. Hold the ON button for approximately 3 seconds until a double beep is heard then momentarily (within one second) release the button and press it again for approximately 3 seconds until a further beep is heard.

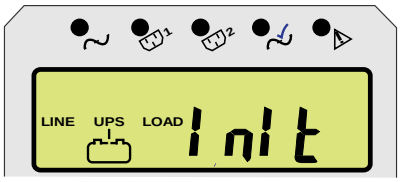




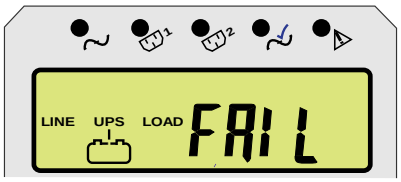
During the first button press

a) The UPS fans will start.
b) The UPS control system will boot-up and initially turn on all the leds and LCD symbols for a few seconds.
c) When control system boot-up has completed, all the leds will turn off, the LCD mimic will display the UPS connected to the battery and the UPS status will be shown as oFF.

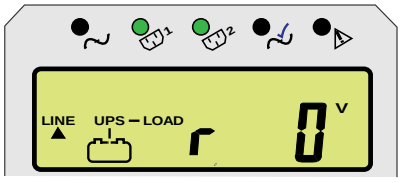
Following the second button press



a) The LCD display will initially keep the UPS oFF screen displayed for a few seconds.
a) The UPS will then run an initialisation self-test routine, with InIt status shown on the LCD.
b) The audible alarm will sound intermittently but may be silenced by pressing the alarm silence (ON) button.



c) If the UPS does not complete its initialisation self test successfully the LCD will show a FAIL status message.



d) If the UPS passes its initialisation self test the LCD mimic display will show that the UPS is operating on battery and the input voltage will be indicated as 0 V on the LCD meter.
e) The two programmable outlet LEDs will illuminate (if programmed to be turned on) to show that these two output are now live, but the utility supply and bypass supply leds will remain extinguished

2. Check all metered parameters to ascertain that the battery voltage and UPS output indications are correct (see page 4-3)

CAUTION: *When turning on the UPS for the first time, or following a long shut down period, leave the unit running for at least eight hours to fully charge the batteries before connecting any critical load.*

4.2 Operator control functions

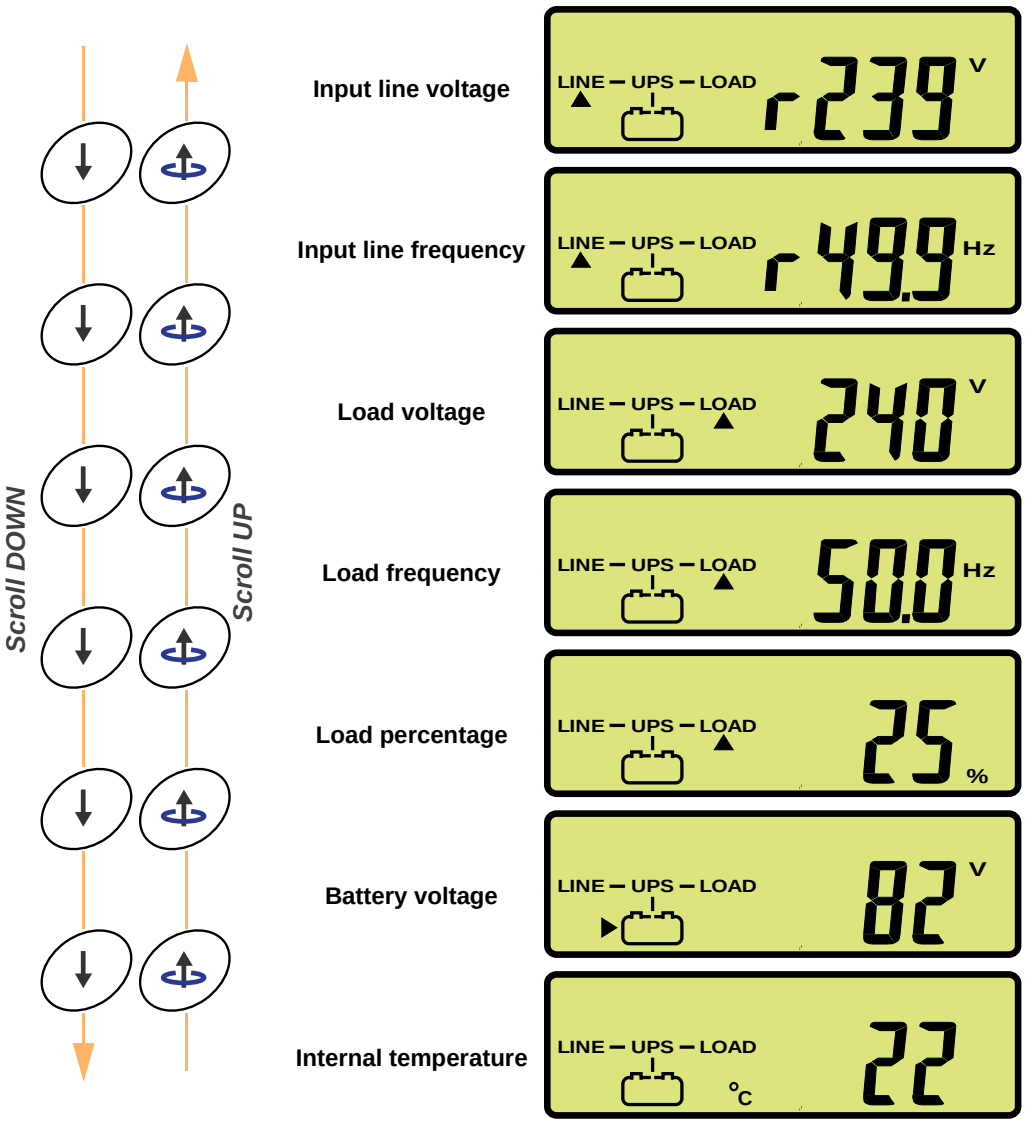
At any time during normal operation of the UPS the operator can:

- Monitor the UPS input supply, output supply, battery and internal temperature using the LCD display.
- Enable or disable the audible alarm.
- Functionally test the battery.

4.2.1 Using the LCD metering function

The LCD metering function can display the input voltage, input frequency, load voltage, load frequency, percentage load, battery voltage and internal temperature. When the UPS is operating, you can scroll through these parameters using the `DOWN` or `UP` button.

Note that the three arrowheads on the LCD mimic diagram identify the source of the meter indication as being either `Input`, `Load` or `Battery`.

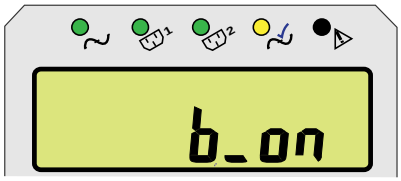


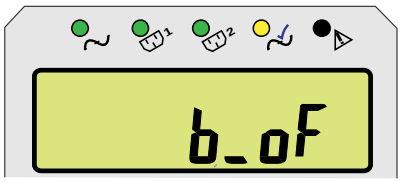
4.2.2 Enable/disable the audible alarm

You can use the following procedure to enable or disable the audible alarm operation. This will not affect the audible beeps associated with pressing the control buttons, which will remain active even if the audible alarm is turned off.

***Note:** If the UPS is powered down and disconnected from its input supply, the audible alarm status will revert to ON b_on (default) when the UPS is next started.*

1. With the UPS on-line, press the FUNCTION button.
   a) The LCD will display either b_on or b_oF. This indicates that the UPS is now in its operator set-up mode and shows the current operational status of the audible alarm.
   b_on = audible alarm enabled – b_oF = audible alarm disabled.
2. Press the UP button to select the wanted audible alarm status.
3. Press the FUNCTION button to activate the selected status and return to the normal LCD Display.



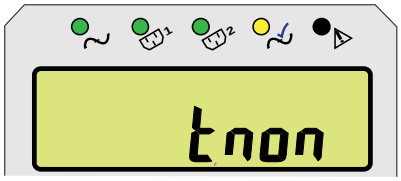


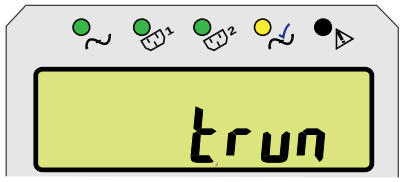
***Note:** If you do not press the FUNCTION button the LCD will revert to its normal display automatically after approximately 10 seconds and the selected audible alarm setting will be activated.*

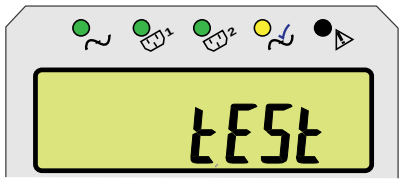
Battery test

You can carry out a periodic battery test using the following procedure. This test effectively places the UPS in its On-Battery mode for approximately 10 seconds, during which time the control electronics monitors the battery performance.

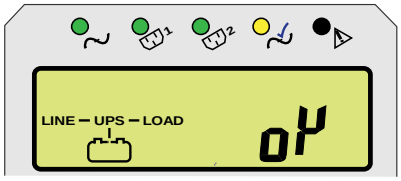
1. With the UPS turned ON, press the FUNCTION button.
   a) The LCD will display b_on (or b_oF).
2. Press the DOWN button.
   a) The LCD will display tnon.
3. Press the UP button
   a) The LCD will momentarily display trun followed by tESt, which will remain on the display while the battery test takes place.







4. When the test is completed the LCD will display this “OK” screen if the battery test was successful, otherwise it will show FAIL.



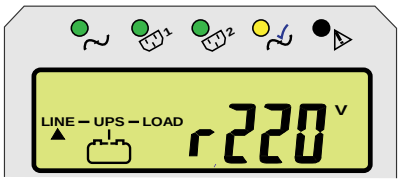
***Note:** If the UPS fails the battery test contact your supplier for technical assistance.*

4.3 Shutdown procedures

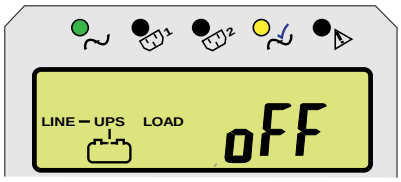
4.3.1 Normal shutdown (with mains available)

This procedure describe the shutdown sequence when turning OFF the UPS when it is operating in its normal 'On Line' mode.

***Note:** Before you shut down the UPS make sure it is safe to disconnect the critical load power.*

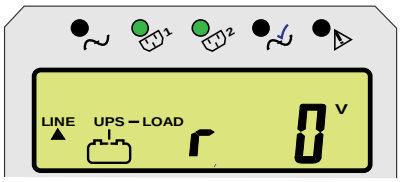


1. Press the OFF button for approximately 3~5 seconds, until you hear two beeps, then release it.
   a) The two programmable UPS outlet leds will extinguish to indicate the removal of UPS output power.
   b) The input mains and bypass supply leds will remain lit.
   c) The LCD screen will show the UPS status as oFF.
   d) On the LCD mimic, the load will be shown disconnected from the UPS but the battery still connected to the input LINE and on charge.
2. To completely shut down the UPS, disconnect the UPS utility mains supply.
   a) The UPS fans and control panel will remain operative for a few seconds before the unit completely shuts down.

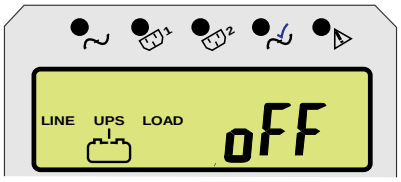


4.3.2 UPS shutdown when on battery

This procedure describe the shutdown sequence when turning OFF the UPS when it is operating in its standby, 'On Battery', mode. You would typically use this procedure during a prolonged utility mains failure if you chose to shutdown the critical load, followed by the UPS, in a controlled manner before the battery reaches the end of its autonomy time.



1. Turn OFF the UPS by pressing the OFF button for approximately 3~5 seconds, until you hear two beeps, then release it.
   a) The two programmable UPS outlet leds will extinguish to indicate the removal of UPS output power.
   b) The LCD screen will show the UPS status as oFF.
   c) On the LCD mimic, the load will be shown disconnected from the UPS.
2. After a few seconds the UPS will completely shut down and all led and display indications will extinguish.



4.4 Manual load transfer between inverter and bypass

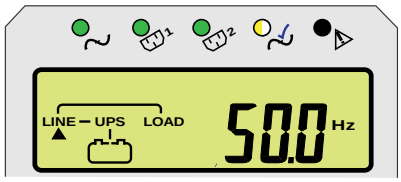
Some installations might include an external (maintenance) bypass circuit connected in parallel with the UPS to provide an alternative power source for the load supply. Such installations are designed to enable the UPS to be totally removed or powered down, for troubleshooting, without disrupting the load.

The PowerWave 1000 allows the operator to manually switch the load between inverter and bypass so that it can be used within an external bypass environment.

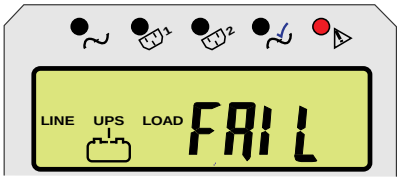
Note: *In practice, a variety of external bypass designs are used, so explicit external bypass operating instructions are not provided here. The following instructions refer only to the UPS internal inverter/bypass transfer operation.*

To transfer the load from the UPS inverter to the internal bypass:

1. Simultaneously press the ON and UP buttons for approximately 3~5 seconds, until you hear a double beep, then release them.
   a) The LCD mimic will show the load connected to the input LINE via the internal bypass.
   b) The batteries are shown still connected to the input LINE and charging (if the charger is still operative).
   c) The bypass supply led will be flashing approximately once a second.
   d) The audible alarm will sound but can be silenced by pressing the ON button.
   e) All metered parameters can be monitored as per normal.

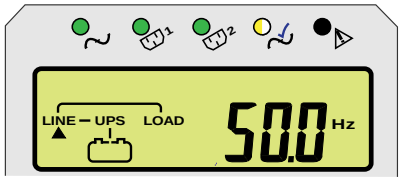


Note: *If the UPS input mains supply is disconnected when it is operating on bypass, the UPS will not revert to battery power but will instead shut down with a FAIL status indication. The UPS internal electronics will remain powered from the battery and all leds will extinguish apart from the red FAULT led, which will be permanently lit, and the audible alarm will sound continuously.*

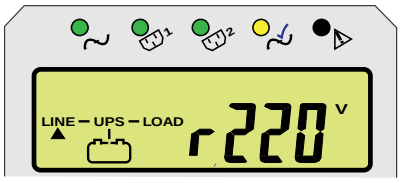


To transfer the load from the static bypass back to the UPS inverter:

1. Simultaneously press the ON and UP buttons for approximately 3~5 seconds, until you hear a double beep, then release them.
   a) The LCD mimic will show the load connected to the UPS.
   b) The bypass supply led will be permanently illuminated.
   c) The audible alarm will sound but can be silenced by pressing the ON button.



   d) The LCD display will revert to normal (on-line mode) indications.



5 Maintenance

5.1 Battery replacement

The UPS batteries are fitted in plastic-covered packs which are accessible from the front of the enclosure and can be replaced without shutting down the UPS.

CAUTION: *If battery replacement is necessary it should undertaken by a trained engineer.*

1. Using a small screwdriver as a lever, carefully remove the two press-fit plastic covers from the left hand end of the UPS front panel. This will expose two front panel securing screws.
2. Remove the two front panel securing screws using a Phillips screwdriver.
3. Carefully pull the fascia away from the front panel to expose the battery packs.
4. Cut any cable ties that are holding the battery cables in place.
5. Disconnect the battery connector(s) and carefully withdraw the battery pack(s).

Use the above procedure in reverse order to fit the battery pack(s)

6 Troubleshooting

6.1 Introduction

If a fault occurs, due to either a UPS internal malfunction or severe overload situation, the UPS will shut down and must be reset by the operator in order to bring it back into operation. Depending on the cause of the fault, the UPS may either shut down entirely (top illustration) or transfer the load to the internal bypass line.

If a transfer to bypass has taken place, the bypass symbol will be shown in the top left hand corner of the LCD display (lower illustration).

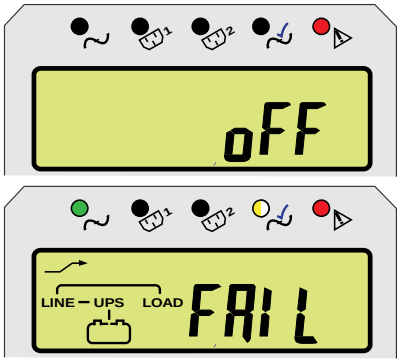


Figure 6.1 UPS Fault screens

6.2 Error codes

In general, under fault conditions the red FAULT led will illuminate and an audible warning will be given. Many faults can be identified by briefly pressing the OFF button, which then displays a fault code on the LCD message area.

Key Point: If you press the OFF button for longer than five seconds the UPS will shut-down.

Error Codes		Audible Alarm (beeps)	
Er05	Weak or faulty battery	Continuous beep	UPS Faulty, Inverter shutdown. All functions inhibited
Er06	Output short-circuited	Single beep every 2 sec.	UPS Faulty, load continued to be supplied via inverter or bypass.
Er07	EPO Operated	Single beep every sec.	UPS On-Battery mode
Er 11	UPS Over temperature	Quick and short successive beeps	Battery low
Er 12	Inverter overload	Two quick and short beeps	Confirm / RS232 port receiving.
Er 14	Fan failure	One quick and short beep	Service Mode OK
Er 18	EEPROM Data error	Two quick and short beeps, repeating every two secs.	UPS Initial start-up with self test.
Er24	Low input voltage (<85-170V) or disconnected battery		
Er28	Bypass overload		
Er31	EEPROM data does not conform to the jumper setting		

Figure 6.2 Alarm interpretation aids

6.3 Troubleshooting a fault condition

If the UPS develops a fault during operation (red FAULT illuminated), you should check the error codes listed below for appropriate solutions. Should the problem persist, please contact your local dealer for assistance.

LCD Error Code	Possible Solution
Er05	**Battery problem:** 1. Check that the battery connections have been made correctly. 2. Measure the battery voltage to ensure it is charged and in good condition. Recharge battery for 8 hours if necessary. 3. Simulate a utility supply outage to establish that UPS is able to provide DC back-up. 4. Contact your local dealer right away if you can find no problem with the above.
	Overload: 1. Disconnect any non critical loads from the UPS output until the overload ceases. 2. Check the condition of the output cables and connectors to determine that they are undamaged and the insulation is sound. Replace the output cables if necessary. 3. Contact your local dealer right away if you can find no problem with the above.
Er 11	**UPS Over temperature:** 1. Remove any objects obstructing the ventilation louvers. 2. Check to ensure that the cooling fans are working properly (see also Er 14), and contact your local dealer to replace the fans if necessary. 3. Contact your local dealer right away if you can find no problem with the above.
?	**Site wiring/earth fault:** 1. Check that the utility AC source 'L' & 'N' have been wired correctly. 2. Check that the earth/ neutral voltage has exceeded the limits specified in chapter 8. 3. Contact your local dealer right away if you can find no problem with the above.
Er 14	**Fan error:** 1. Verify if the ventilating fans are functioning properly. Do not attempt to replace the fans by yourself. 2. Contact your local dealer for fan replacement.
Other	For all other error codes, contact your local dealer for technical assistance.

6.4 Troubleshooting an operational problem.

Symptom	Possible Solution
UPS fails to provide battery back-up, or its back-up time is shorter than its specified performance.	1. Charge the battery for eight hours. If the back-up time remains unsatisfactory after 8 hours of charging, please contact your local dealer for battery replacement.
UPS operation appears to be normal but there is no output to load.	1. Check that all output power cords are connected correctly. 2. If the problem is with one of the programmable outlets, check the programmed parameters and reset them if necessary. 3. If the problem persists, consult your local dealer for technical assistance.
The UPS switches to battery mode then back to on-line mode, when the connected device is turned on. Or, the UPS switches back and forth between battery and on-line mode.	1. Check for a faulty UPS input cable or utility supply wall receptacle and replace/repair any faulty item found. 2. If the problem persists, consult your local dealer for technical assistance.
Strange noise and/or odour emitted by UPS	Immediately shut down the UPS System. Disconnect the UPS input power and call for service.

6.5 UPS Fault handling

6.5.1 UPS Overload

To prevent severe inverter damage caused by inrush currents, the UPS is equipped with an electronic overload protection feature which switches the load to the bypass line within 30 sec if the UPS load rises to between 105% – 120% of its rated capacity. As inrush currents are normally short-lived, once the current being drawn from the bypass falls below <105%, the UPS will switch back to inverter mode automatically.

Note that if the UPS appears to be repeatedly momentarily overloading it could be due to the inrush currents produced as various multiple loads are started. If the UPS is overloaded by >150% its inverter will shut down immediately.

The bypass line is also equipped with overload protection. Its overload capacity/time characteristics are illustrated in the table below.

Load (%)	110-120	121-130	131-135	136-145	146-148	149-157	158-176	177-187	188<
Delay Time (sec)	250	125	50	20	5	2	1	0.32	0.16

6.5.2 Output short circuit

Output load short circuit when the output supply is via inverter

If output load is short circuited while it is being supplied via the inverter:

1. The inverter is shutdown immediately and stop the supply to the load.
2. The FAULT led will illuminate up and the audible alarm will beep continuously.
3. The UPS will not switch on automatically after the short-circuit condition is eliminated. It has to be re-started manually (see paragraph 4.1.1).

Output short-circuit when the output supply via the bypass line

If the output load is short-circuited in bypass mode:

1. The utility fuse/breaker will be activated (open-circuited) to prevent the output load from damage.
2. You must replace the fuse with a fuse of the same rating after the cause of the short-circuit condition has been rectified.

6.5.3 Inverter/internal over-temperature

If the UPS experiences an internal over-temperature when the utility supply is normal it will transfer the load to the bypass line, and switch back to inverter mode when the over-temperature situation has been eliminated.

If over temperature occurs when the utility supply is abnormal:

1. The audible alarm will beep continuously.
2. The FAULT led will illuminate.
3. The UPS will cut off the load supply.

6.5.4 Inverter over-current and output voltage out of tolerance

If the UPS develops a fault and its inverter delivers an over-current and out-of-tolerance voltage:

1. The UPS will transfer the load to the bypass line as long as the utility supply is normal.
2. The UTILITY led, BYPASS led and FAULT led will illuminate.

If these fault conditions occur when the utility supply is abnormal:

1. The UPS will cut off the supply to its outlets and shut down.
2. The FAULT led will illuminate.

7 Options

7.1 The importance of UPS management

The utility supply is inevitably unreliable every now and then; and assuring continuous power to all the facilities connected to it can be a difficult task. The situation is further complicated if worldwide systems are managed via a Local Area Network (LAN) or Wide Area Network (WAN).

However, by using the PowerWave 1000 UPS system in conjunction with purpose-designed network management tools, a systems administrator can take measures to back-up data and prevent system errors or data loss even in the event of a relatively long utility supply outage. In the case of an abnormal utility supply, suitable UPS management software can also enable a system administrator to monitor all concerned networks from a central point and identify bottlenecks at an early stage.

However, in spite of extensive system monitoring, serious damage can still occur if an administrator fails to intervene in a timely manner. It is important therefore that the installed UPS software will react automatically in such a case and shut down the supplied system in a safe and controlled manner.

Uninterruptible Power Supplies Ltd considers it important to have a complete solution for its UPS systems, and offers its customers a number of remote control and monitoring tools to provide optimum protection. The standard PowerWave 1000 equipment includes management software and user manual. WAVEMON software, with optional RCCMD server shutdown, is available as optional equipment.

7.2 WAVEMON shutdown and management software

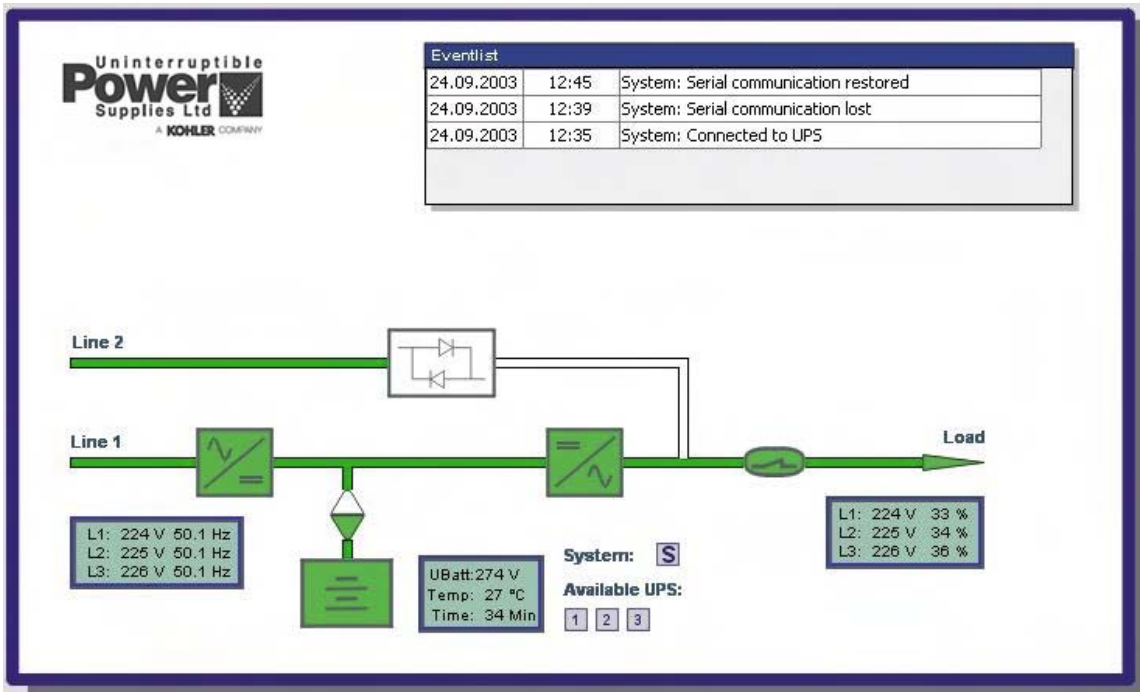


Figure 7.1 WAVEMON Monitoring screen

WAVEMON is a software application designed to operate with many of the systems supplied by Uninterruptible Power Supplies Ltd and features both UPS monitoring and automatic UPS/server shutdown facilities. It comprises a bespoke software package which is installed on a local PC and communicates with the UPS via USB or a standard RS232 serial cable of up to 15m in length.

Uninterruptible Power Supplies Ltd offer suitable monitoring software with SNMP functionality for NetWare, OS/2, all Windows NT systems on INTEL and ALPHA network platforms.

The main features of WAVEMON are:

- On-screen autonomy time/battery time countdown.
- On-screen server log-off and shutdown procedure.
- Time and date stamp event log.
- Extensive logging of all UPS activity and power quality data.
- Permits alarm warnings to be monitored remotely via email.
- Scheduled UPS service mode and other systems status.
- Graphical user interface for Windows-compatible platforms.
- Automatic unattended local shutdown.
- Special modules for MS-Office software to close and save open documents.
- Compatible with all optional modules like UPSDIALER, SNMP adaptors, temperature sensors, etc.

7.2.1 Functional description

WAVEMON is a client/server software application for networks and local workstations. In general, it consists of two parts: the server module of the UPS management software is *UPSMAN* which communicates with the UPS via an RS232/USB interface. Running as a background application, *UPSMAN* collects and interprets the messages received from the UPS and places them at the disposal of the client module *UPSMON,* as well as any connected SNMP-based instrumentation and control system.

If *UPSMAN* detects voltage variations or a power failure, it can execute various ‘system event’ routines, by means of which, for example, the server is switched off or a warning is sent to the connected users. These ‘system event’ routines are a part of the management software and can be configured in accordance with local application requirements.

The software of your PowerWave 1000 UPS unit can be integrated into a network in two ways:

1. By the server which is supplied by the UPS itself and has been integrated into the network. In most cases this server is used as a sub-agent and you only need the WAVEMON software (without an SNMP adapter). You will also need to establish an RS232/USB connection between the UPS and computer/ server.
2. In many cases the use of what is referred to as an ‘SNMP adapter’ is to be preferred in order to integrate the UPS into the network. In this case up to 50 computers can be shut down in one RCCMD environment. RCCMD (remote console command) is an additional software module that is used in order to execute a command (typically a shutdown command) in a remote system.

7.2.2 Licensing

A licence is issued with every software serial number for use of what is known as the ‘UPS service’ on a single server in connection with one UPS and an unlimited number of connected WINDOWS workstations. For operation with two or more servers, a further licence is required for each additional server. In this case it is of no importance whether the UPS service on these servers is active or whether the server was stopped by a remote UPS service. The same applies to the use of RCCMD with the ‘remote send/receive’ modules for ‘multi-server shutdown’ under NT, UNIX and other operating systems.

The service programs are generally supplied as single licences. In order to use a single CD-ROM for several ‘multi-server shut-down’ units you must acquire additional licence codes.

7.3 SNMP adapters

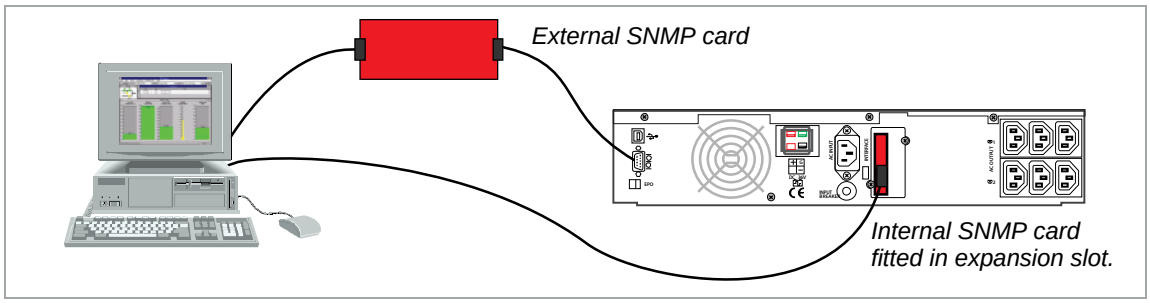


Figure 7.2 SNMP Adapters

Simple Network Management Protocol (SNMP) is a world-wide, standardised communication protocol that can be used to monitor any network-connected device via a simple control language, and display the results in a browser-based application.

The UPS management software can make your UPS data available in this SNMP format thanks to the software agent built in to the SNMP adapter. Uninterruptible Power Supplies Ltd offer software with SNMP functionality for Novell, OS/2, and Windows that run both on INTEL and on ALPHA, DEC VMS and Apple.

Two models of SNMP adapters are available for use with the PowerWave 1000, both of which share the same functionality. An internal SNMP card can be fitted into the communications card expansion slot located on the UPS rear panel and communicates with the UPS via a serial interface. An optional external SNMP adapter can be used, located remotely and connected to the UPS via its RS232 port.

The SNMP adapter can be configured via Telnet, http (browser) or serial connection. For normal operation, at least one Ethernet network connection is necessary. Further details are provided in the manual that is supplied on the WAVEMON installation CD.

RCCMD

RCCMD (Remote Console Command Module) for 'multi-server shutdown', is an independent software module intended for transmitting and receiving 'remote commands'. The new version RCCMD2 is, similar to WAVEMON, available for the most widespread operating systems. Using the 'RCCMD send' function, the SNMP adapter can send status messages to connected users or initiate automatic shutdown throughout the whole network. Our SNMP adapters are fully compatible with RCCMD.

7.4 AS400 (dry contact) card

The DCE dry contact card provides volt-free outputs that can be used for the automatic and orderly shutdown of servers (AS400) or used as control inputs to building management systems.

The signal descriptions of the 10 pins of the dry contact card are shown below. Note that all pins except Pins 9 and 10 (which are isolated) are link-selectable to be either short-circuited or open-circuited to the common Pin 8 when the monitored parameter is 'active'.

Figure 7.3 DCE Dry contact card

The pin assignment of the 10-pin terminals are:

1	UPS on bypass mode	6	Battery weak or faulty
2	Utility input abnormal	7	UPS fault Alarm
3	Utility input normal	8	Common
4	Inverter On	9	Shutdown UPS positive (+) signal
5	Battery Low	10	Shutdown UPS negative (-) signal

To shut down the UPS, you must connect a DC voltage of 5.5V~25V between pin 9 (+) and pin 10 (-).

7.5 USE (USB) card

This card can be installed in the Option Slot located on the rear of the UPS to facilitate an alternative USB interface.

The USB configuration detail is described in paragraph 2.4.1.

Figure 7.4 USB Option card

7.6 R2E (second RS-232) card

This card can be installed in the Option Slot located on the rear of the UPS to facilitate an alternative RS-232 interface.

The RS-232 configuration detail is described in paragraph 2.4.1.

Figure 7.5 RS232 Option card

8 Specifications

Model Rating		1 kVA	2 kVA	3 kVA
Apparent output power	VA	1000	2000	3000
Real output power	W	800	1600	2400
Autonomy time (standard battery)	min.	6 Minutes		
Power factor		0.8		
Topology		Double conversion online VFI-SS-111		
Switching time Inverter-Bypass (typical)	ms	2.5	0.0	0.0
Form factor		19"-Rack / Tower		
Input :				
Nominal voltage	VAC	Single phase, 120 - 288 VAC (@33%) Single phase, 140 - 288 VAC (@66%) Single phase, 160 - 288 VAC (@100%)		
Nominal current (max.)	A	3.8	8.0	11.5
Frequency	Hz	50/60 Hz, ± 5 Hz on battery (unless synchronised to line)		
Power factor		0.99 at full rated linear load		
Output :				
Voltage	VAC	Single phase, 230 VAC, selectable at 200/208/220/230/240 VAC 2 programmable outputs (setting via software)		
Voltage regulation	%	±1 (until low battery warning)		
Current (max.)	A	4.35	8.7	13.04
Frequency	Hz	50/60 Hz autoselect, ±0.1 % Unless synchronised to line		
Synchronisation window	Hz	±3 Hz or ±1 Hz (setting via software)		
Voltage distortion (THD)	%	≤ 3% (linear load), ≤ 7% (non linear load)		
Overload capability (AC Mode)	%	Up to 105% Load = normal operation, from 106%...120% Load = switching to bypass after 30 Sec. from 121%...150% Load = switching to bypass after 10 Sec from 151 % Load = switching to bypass immediately		
Overload capability (On Battery Mode)	%	>150% = immediate UPS shutdown		
Short circuit handling		In normal mode: output breaker / electronic fuse In battery mode: output breaker / electronic fuse In bypass mode: Input Fuse		
Overtemperature (AC Mode)		Switch to bypass		
Overtemperature (On Battery Mode)		Immediate UPS shutdown		
Crest factor		3:1		
Heat dissipation (approx)	W	150	275	415
Efficiency :				
Mains operation (100/75/50/25% Load)	%	85/82/82/80%	85/82/82/80%	88/85/85/83%
Battery mode (100/75/50/25% Load)	%	83/80/80/78%	83/80/80/78%	85/82/82/80%
Environment:				
Temperature (°C)	°C	Operating: 0-40 / Storage: 0-45		
Altitude		0-2000m up to 40°C / 3000m up to 35°C		
Humidity		0%...90%, non-condensing		
Sound level	dBA	50 dBA		

Model Rating		1 kVA	2 kVA	3 kVA
Batteries :				
Type / Quantity		VRLA, leak-proof (lead-acid), hot swappable, 3 x 12V/ 7.2Ah (intern)	VRLA, leak-proof (lead-acid), hot swappable, 6 x 12V/ 7.2Ah (intern)	VRLA, leak-proof (lead-acid), hot swappable, 6 x 12V/ 9.0Ah (intern)
Charge rate / Charging time	A	1.8 A max. / 4 hours up to 90% Load	2.16 A max. / 4 hours up to 90% Load	2.7 A max. / 4 hours up to 90% Load
Charging voltage	VDC	41 ± 0.5	82 ± 0.5	82 ± 0.5
Discharging current (with UPS and Mains OFF)	uA	< 30uA ± 10 uA		
Life cycle (typical)		Up to 5 years, at max. 20°C ambient temperature		
Communications :				
Interfaces		1 x RS-232, 1 x USB, optional : SNMP-Card, Modbus-Card, Relay-Card		
Mechanical Data :				
Dimensions (HxWxD)	mm	88 x 440 x 405 2U x 19" x 405 mm	88 x 440 x 650 2U x 19" x 650 mm	88 x 440 x 650 2U x 19" x 650 mm
Weight	kg	19	30	33
Power connectors		Input: 1 x IEC-C14, Output: 6 x IEC-C13	Input: 1 x IEC-C14, Output: 6 x IEC-C13	Input: 1 x IEC-C20, Output: 4 x IEC-C13 1 x IEC-19
Other connectors		1 x USB, 1 x RS232, 1 x 2-pole EPO-Connector 1 x Interface Slot		
Options :				
Accessories		External bypass External battery module Output distribution 19"- pull out rack rails (up to 1 Meter)		
Compatibility :				
Operating systems		Windows, Unix (and derivatives), OS/2, Novell, AppleOS		
Audible Alarms :				
Battery mode		Will sound every 1.5 Seconds		
Battery low		Resounds every 0.2 Seconds		
Overload		Resounds every 3 Seconds		
General error		Will sound permanently (or every 3 Seconds)		
Standards :				
Safety		EN 62040-1-1, IEC 60950-1		
EMV-Compatibility		EN 62040-2, EN 61000-3-2, EN61000-3-3, FCC-A		
Performance features		IEC/EN 62040-3		
Product certification		CE, FCC (additional versions on request)		
Protection Class		IP 20		
Manufacturing standards		ISO 9001.2000		